UNIVERSITY OF ILLINOIS
ENGINEERING EXPERIMENT STATION
BULLETIN SERIES No. 381

AN INVESTIGATION OF THE BACKWATER PROFILE FOR STEADY FLOW IN PRISMATIC CHANNELS

A REPORT OF AN INVESTIGATION

CONDUCTED BY

THE ENGINEERING EXPERIMENT STATION
UNIVERSITY OF ILLINOIS

IN COOPERATION WITH

THE UNITED STATES GEOLOGICAL SURVEY

BY

WALLACE M. LANSFORD
PROFESSOR OF THEORETICAL AND APPLIED MECHANICS

AND

WILLIAM D. MITCHELL
HYDRAULIC ENGINEER, UNITED STATES GEOLOGICAL SURVEY

PUBLISHED BY THE UNIVERSITY OF ILLINOIS

PRICE: FIFTY CENTS

3000—3-49—39000

UNIVERSITY
OF ILLINOIS
PRESS

CONTENTS

NO.		PAGE
I.	Introduction	7
	1. Object and Scope of Investigation	7
	2. Acknowledgments	8
II.	Apparatus and Method of Testing	11
	3. Apparatus	11
	4. Test Procedure	17
III.	Observed Data	22
IV.	Analysis of Data	23
V.	Discussion of Results	34
	Selected Bibliography	36

LIST OF FIGURES

NO.		PAGE
1.	The Rectangular Channel	10
2.	Backwater Gate	11
3.	Roughness of (a) Poultry Flooring and (b) Chain Link Fencing	13
4.	Channel Cross-sections	14
5.	Rating Curves for 12-in. and 24-in. Elbow Meters	15
6.	Rating Curves for Various Open Channel Cross-sections	18–19
7.	Method of Projecting Backwater Curve	20
8.	Backwater Profiles for Cross-section 2	27
9.	Backwater Profiles for Cross-section 3	28
10.	Backwater Profiles for Cross-section 4	29
11.	Backwater Profiles for Cross-section 5	30
12.	Backwater Profiles for Cross-section 6	31
13.	Velocity Distribution in Cross-section 2	32
14.	Velocity Distribution in Cross-section 4	33
15.	Velocity Distribution in Cross-section 5	After 34

LIST OF TABLES

NO.		PAGE
1.	Profile, Cross-section 1 y_n 0.386	39
2.	Profile, Cross-section 1 y_n 0.504	40
3.	Profile, Cross-section 1 y_n 0.610	41
4.	Profile, Cross-section 1 y_n 0.703	42
5.	Profile, Cross-section 1 y_n 0.810	43
6.	Profile, Cross-section 1 y_n 0.958	44
7.	Profile, Cross-section 1 y_n 1.120	45
8.	Profile, Cross-section 1 y_n 1.260	46
9.	Profile, Cross-section 1 y_n 1.460	47
10.	Profile, Cross-section 1 y_n 1.648	48
11.	Profile, Cross-section 1 y_n 1.839	49
12.	Profile, Cross-section 2 y_n 0.391	50
13.	Profile, Cross-section 2 y_n 0.612	51
14.	Profile, Cross-section 2 y_n 0.812	52
15.	Profile, Cross-section 2 y_n 1.121	53
16.	Profile, Cross-section 2 y_n 1.489	54
17.	Profile, Cross-section 2 y_n 1.840	55
18.	Profile, Cross-section 3 y_n 0.404	56
19.	Profile, Cross-section 3 y_n 0.606	57
20.	Profile, Cross-section 3 y_n 0.773	58
21.	Profile, Cross-section 3 y_n 1.071	59
22.	Profile, Cross-section 3 y_n 1.512	60
23.	Profile, Cross-section 4 y_n 0.528	61
24.	Profile, Cross-section 4 y_n 0.780	62
25.	Profile, Cross-section 4 y_n 1.028	63
26.	Profile, Cross-section 4 y_n 1.369	64
27.	Profile, Cross-section 4 y_n 1.419	65
28.	Profile, Cross-section 4 y_n 1.877	66
29.	Profile, Cross-section 4 y_n 2.335	67
30.	Profile, Cross-section 5 y_n 0.456	68–69
31.	Profile, Cross-section 5 y_n 0.687	70
32.	Profile, Cross-section 5 y_n 0.905	71
33.	Profile, Cross-section 5 y_n 1.158	72
34.	Profile, Cross-section 5 y_n 1.285	73
35.	Profile, Cross-section 5 y_n 1.704	74
36.	Profile, Cross-section 5 y_n 2.525	75
37.	Profile, Cross-section 6 y_n 0.471	76
38.	Profile, Cross-section 6 y_n 0.905	77
39.	Profile, Cross-section 6 y_n 1.294	78

NO. PAGE

40. Profile, Cross-section 6 y_n 2.431 79
41. Profile, Cross-section 7 y_n 1.295 80
42. Normal Depth–Discharge Rating, Cross-section 2 81
43. Normal Depth–Discharge Rating, Cross-section 3 82
44. Normal Depth–Discharge Rating, Cross-section 4 83
45. Normal Depth–Discharge Rating, Cross-section 5 84
46. Normal Depth–Discharge Rating, Cross-section 6 85
47. Rating for Differential Gage, 12-in. Line 86
48. Rating for Differential Gage, 24-in. Line 87
49. Summary of Pitometer and Volumetric Discharge Measurements . . . 88
50. Summary of Current-meter Discharge Measurements 89
51. Simultaneous Observations of Normal Depth and/or Differential Gages 90–91
52. Details of Current-meter Discharge Measurements 92–94

AN INVESTIGATION OF THE BACKWATER PROFILE FOR STEADY FLOW IN PRISMATIC CHANNELS

I. Introduction

1. *Object and Scope of Investigation.* — The analysis of steady flow in an open channel has been presented by several authors.[1, 2, 3]* However, the only laboratory data concerning backwater profiles, known to the authors, is that presented by Mononobe[4]. The channel which he used was small in comparison to those found in practical hydraulics; the effective length was 30 ft, the maximum cross-sectional area 1.1 sq ft and the maximum discharge approximately 0.625 cfs. However, the technique he used has helped to point the way in the investigation herein reported.

Bakhmeteff[4] in his discussion of Mononobe's work says:

> The attempts of Professor Mononobe to complement his analysis with experimental work should be more than welcomed. In fact, although the varied flow theory has been the subject of repeated treatment, scarcely any experimental data are available, the best probably being still those assembled in the classical opus by Darcy and Bazin. The usual difficulty lies in the necessity of having very long flumes, and Professor Mononobe's manner of using short canals is ingenious. It is to be hoped that Professor Mononobe's experiments will once more draw attention to this much neglected field of research, and that, in particular, observations on a larger scale will become available.

The objective of this investigation is to obtain and make available, on a much larger scale than heretofore presented, surface profiles of the M-1 type for steady flow in prismatic channels. These data then are used as a test of the most promising method of computing these same profiles. A further objective of the investigation is to provide to the engineering profession in general, and to the United States Geological Survey in particular, a group of data on which may be based extensive studies of the three-dimensional relations between stage, fall, and discharge. It is understood that the Geological Survey will make a comprehensive analysis of, and prepare an additional report on, this phase of the project. An ability to compute the backwater profile with a higher degree of accuracy and a greater degree of confidence than heretofore possible will represent a valuable contribution toward the subject and later study. The principle of rigidity as herein described is used only as a tool, or intermediate step toward these ultimate goals.

Since the backwater curve of the M-1 type for steady flow is asymptotic to the water surface the end of the curve for practical

* The numbers in parentheses refer to corresponding items in the Bibliography.

purposes must be specified arbitrarily. In this investigation we have specified that the backwater curve ends when the depth due to backwater is less than 1 per cent of the normal depth for that particular flow. Hence the depth y would equal 1.01 times the normal depth y_n.

The data herein shown were taken during tests on 41 different backwater profiles made on 7 different cross-sections of a channel set on a slope of 0.003. A rectangular cross-section with 4 different roughness combinations and a narrow channel with overflow banks with 3 different roughness combinations were used. The quantity of flow was varied from 0.79 cfs to 40.4 cfs. Many current-meter and pitot-tube traverses were taken during the tests to ascertain the velocity distribution over a cross-section of the channel. To obtain these data required a great amount of time; in many tests the apparatus was operated continuously for more than 12 hr.

2. *Acknowledgments.* — The investigation herein reported was carried out in the Fluid Mechanics and Hydraulics Laboratory at the University of Illinois as a part of the work of the Engineering Experiment Station.

Collection of the data contained herein was begun during 1944 by Mr. Edgar G. Barron and Mr. William D. Mitchell, in partial fulfillment of the requirements for the degree of Master of Science. These men were Hydraulic Engineers of the Water Resources Division, United States Geological Survey, attached to the district office at Champaign, Illinois. Their graduate thesis[7] presented the accompanying data for cross-sections 1 and 2.

The tests on cross-sections 3 to 7, inclusive, were made possible by a cooperative agreement between the Engineering Experiment Station of the University of Illinois and the United States Geological Survey, Water Resources Division, of which Mr. C. G. Paulsen is Chief Hydraulic Engineer. The Survey provided funds in part payment of the expenses of the tests and also furnished the part-time services of Mr. William D. Mitchell, who supervised the tests and the computations. In making the tests Mr. Mitchell was ably assisted by Mr. James F. Halsey, laboratory assistant in the Department of Theoretical and Applied Mechanics.

Other members of the Champaign staff of the Survey gave valuable assistance. Mr. J. H. Morgan, District Engineer, was very helpful in loaning needed equipment and making it possible for Survey personnel to help with this work. Messrs. J. H. Montgomery and

J. M. Busalacchi, Hydraulic Engineers, generously and carefully made most of the many current-meter discharge measurements. Mr. John R. Stipp, Hydraulic Engineer, reviewed and checked the analysis of the discharge measurements and the preparation of the rating curves and tables. All tables which appear in this report were composed on the vari-typer in the Survey office by Mrs. Osie B. Winget, clerk-typist. Grateful acknowledgment also is made for the helpful advice and criticism of the staff of the Survey, particularly R. W. Davenport and W. S. Eisenlohr, of the Technical Coordination Branch, Washington, D. C.

All the work was done under the direction of Wallace M. Lansford, Professor of Theoretical and Applied Mechanics.

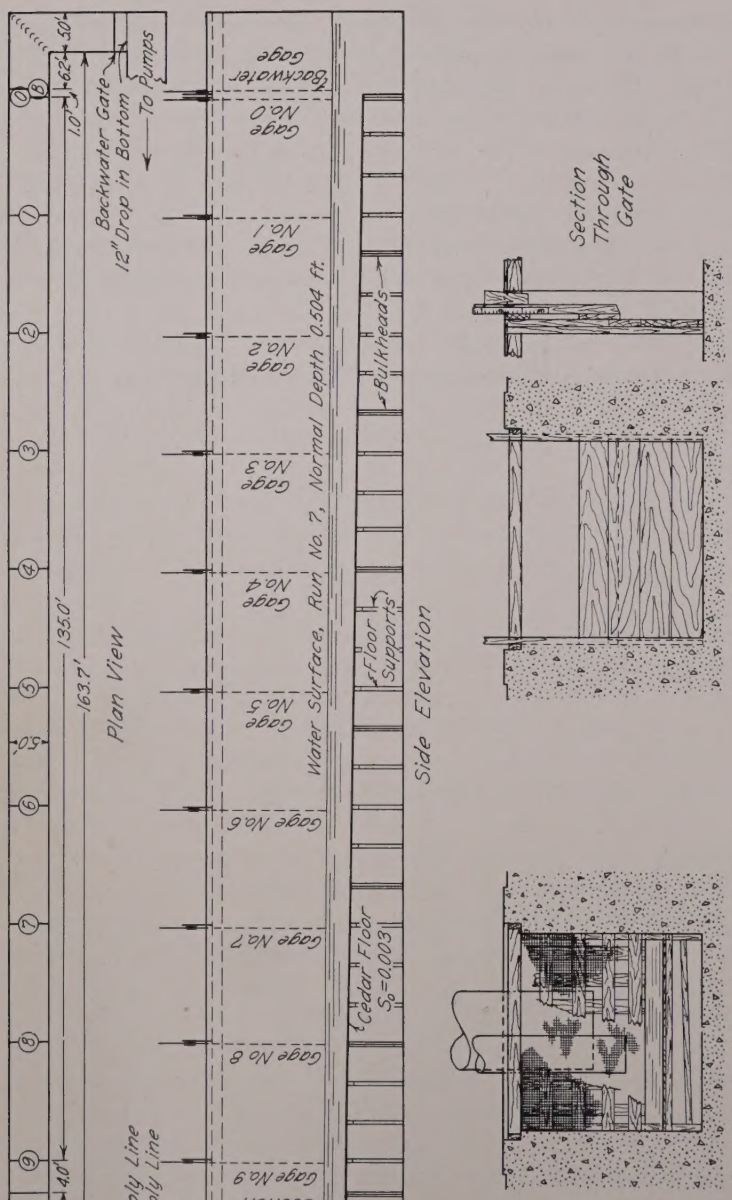

FIG. 1. THE RECTANGULAR CHANNEL

II. Apparatus and Method of Testing

3. *Apparatus.* — The concrete channel as constructed in the floor of the laboratory is rectangular in cross-section, 5.0 ft wide and 163.7 ft in over-all length, with an unobstructed depth of 4.75 ft. The concrete floor is level except for a 1-ft drop well downstream from the usable portion of the channel. To obtain the slope desired, a floor of cedar planks was laid in the channel on a slope of 0.003, constructed in 10-ft sections supported at 5-ft intervals and made to fit the channel width. It was so designed and built that the space beneath it would be filled with water when tests were in progress but motion of this water was prevented by watertight bulkheads at each end of the floor and at 20-ft intervals throughout its entire length. Figure 1 shows the channel and the first backwater gate, which was later

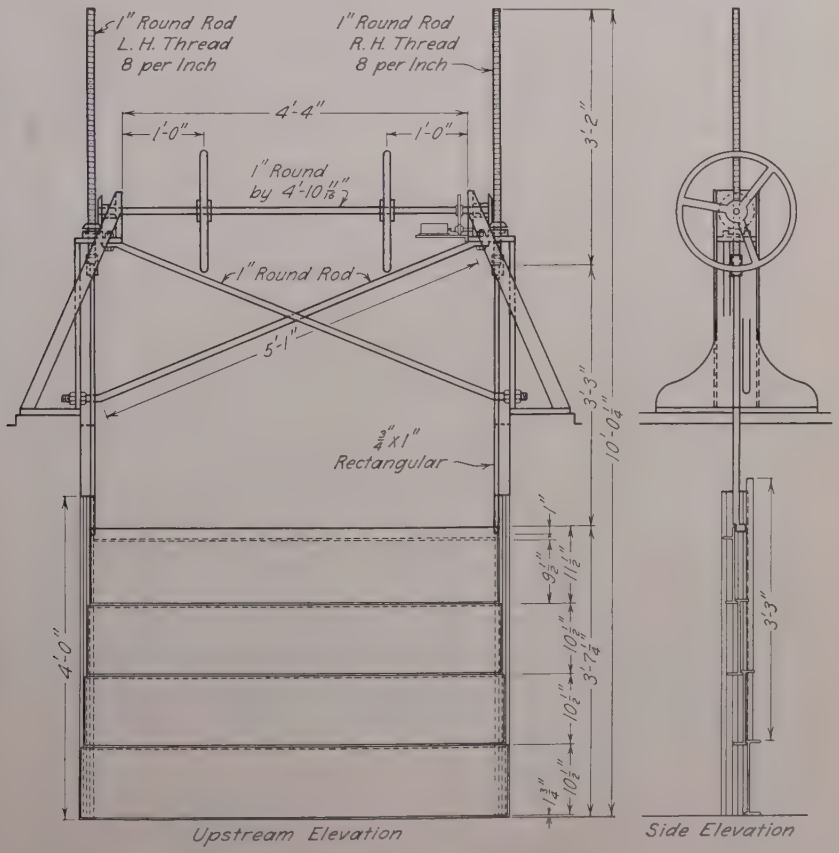

Fig. 2. Backwater Gate

replaced by a much improved gate (Fig. 2). The second gate was so constructed that a change in elevation of each 0.001 ft of the crest was noted on a counter at the top of the gate.

Water was supplied to the channel through a 12-in. pipe in quantities up to 14 cfs from a constant level standpipe 6 ft in diameter and 65 ft high; larger quantities up to approximately 40 cfs were supplied through a 24-in. pipe by a 20- by 20-in. centrifugal pump driven by a 200 hp synchronous motor.

A wooden baffle was so constructed at the upper end of the channel that both the 12-in. and the 24-in. pipe outlets were submerged when tests were being made. Two heavy galvanized wire mesh screens, 11 in. apart and about 9.6 ft from the upstream end of the channel formed a second baffle which considerably dampened the turbulence created by the high velocities from the supply pipes.

Cross-sections 1, 2, 3, and 4 were all rectangular in shape and differed only in the roughness of the walls and bottom. The roughness used on cross-sections 1 and 2 was a galvanized steel wire mesh 2 in. by 4 in. of No. 12 gage wire. A photograph of this wire is shown in Fig. 3a. The wire was always so laid that the 2-in. dimension was parallel with the direction of motion of the water and gave a value of n in the Manning formula of approximately 0.019. In cross-section 1, the wire was laid on the bottom and extended up the sides of the channel to a depth of 1.5 ft. In cross-section 2 the wire roughness was extended up the side the entire depth. In cross-section 3 and 4 the roughness was formed by using a chain link, 2-in. diamond mesh wire fencing. The wire in this fencing was of No. 9 gage and galvanized. This roughness was further increased by placing a wooden strip of triangular cross-section through the link of the fencing at intervals of 6 in. The strip extended the entire height of the fence. A photograph of the wire fencing and added wooden roughness is shown in Fig. 3b.

In cross-section 3 the roughness shown in Fig. 3a was laid on the bottom and extended up the sides of the channel to a depth of 1.5 ft. The rest of the wall was covered with a roughness shown in Fig. 3b. The roughness in cross-section 4 was laid similar to that in cross-section 2 in that the roughness was extended up the sides of the channel the entire depth. The roughness used in cross-sections 3 and 4 gave the value of n in the Manning formula of approximately 0.026.

Cross-sections 5, 6, and 7 were nonrectangular and consisted of a 1-ft by 1-ft channel with a sloping overflow or flood plain on each side somewhat similar to the usual natural stream.

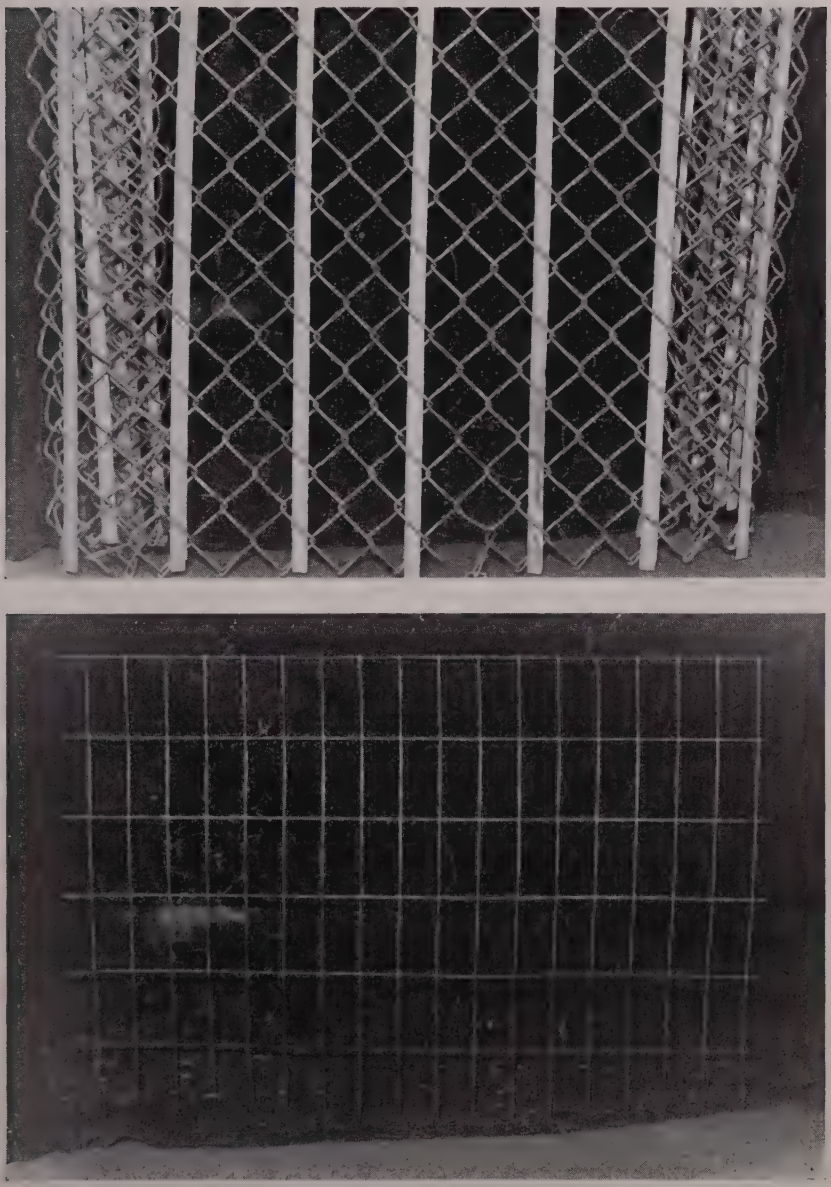

FIG. 3. ROUGHNESS OF (A) POULTRY FLOORING AND (B) CHAIN LINK FENCING

FIG. 4. CHANNEL CROSS-SECTIONS

A sketch of all cross-sections used, with roughness coverage, is shown in Fig. 4.

The discharge into the channel was measured by two elbow meters[5] which were calibrated in place. The 24-in. elbow meter was calibrated by volumetric measuring, and the 12-in. elbow meter by means of current-meter traverses in the channel. Rating curves for the 12-in. elbow meter and for the 24-in. elbow meter are shown in Fig. 5, with corresponding Tables 47 and 48. Control valves for the 12-in. and 24-in. lines were located 10 ft and 13 ft, respectively, above the concrete channel bottom as indicated in Fig. 1. Revolution counters installed on each valve indicated the setting of the valve and proved a great help in obtaining the desired discharge quickly. (See Table 51.) Baffles were so constructed that the outlet from each pipe line was always submerged during a test run.

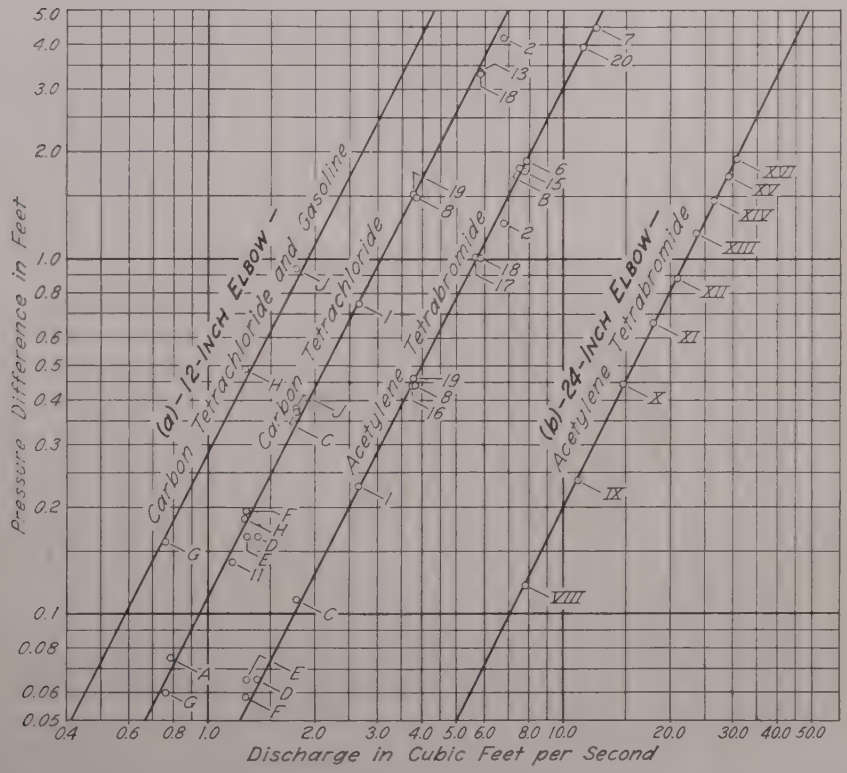

Fig. 5. Rating Curves for 12-in. and 24-in. Elbow Meters

In the tests on cross-sections 1, 2, 3, and 4, ten point-gages were mounted on 2-in. by 10-in. planks. These planks were mounted at 15-ft intervals with the 10-in. dimension vertical. The gages, set over the center line of the channel as in Fig. 1, were numbered consecutively, the most downstream gage being 0. For cross-sections 5, 6, and 7, gage No. 0 was moved upstream about 5 ft and 14 gages spaced at 10-ft intervals were used. An additional point gage, designated "backwater gage," was first installed 1 ft downstream from the wooden floor; its purpose was to indicate any change in the surface slope at the 1.0 ft drop from the wooden floor to the concrete bottom. When the improved metal backwater gate was installed this "backwater gage" was moved to a point 4 ft downstream from the 90-deg bend and 3½ ft upstream from the backwater gate. All gages except the backwater gage were set to read depth directly — that is, the vernier of each gage was set 4.500 ft above the bed elevation at that point. The backwater gage was set to same datum as gage No. 0. The gages were made of aluminum alloy with a 2.5-ft slide graduated in tenths and hundredths of feet and were equipped with a vernier scale which could be read to thousandths of a foot. Since the range of depths in the channel exceeded 2.5 ft, two sets of points were provided for each gage. The long points were used for depths less than 2.0+ ft; for greater depths, points exactly 2.0 ft shorter were used. The readings then were increased by 2.0 ft to indicate depth. All gages were adjusted to datum by the level water surface in the channel after it had been undisturbed for at least 24 hrs. Checks were made at frequent intervals to insure maintenance of constant datum.

In order to check the discharge measurements as indicated by the elbow meters, more than 100 current-meter traverses were made at various rates of flow and depth of the water in the rectangular channel. (See Table 52.) Two types of current meters were used — the standard Price current meter, Nos. 2067 and 3866, and the Pygmy current meter, Nos. A-65 and 282, a meter much smaller than the Price, recently developed and used by the United States Geological Survey. All meters used were in excellent condition and all had been individually rated at the National Bureau of Standards. With the discharge maintained at a fixed rate, it was possible to manipulate the backwater to obtain various conditions of depth and velocity.

The pitot-tube traverses were made with a modified pitometer. One leg pointed upstream and a similar leg pointed downstream, the two being connected to an inclined air-water differential gage in which the air could be evacuated to the desired pressure. This apparatus was used to measure velocities in cross-sections 5 and 6. The

coefficient of this pitometer was 0.88, and values of velocities measured by it compared well with current-meter results. Rating curves for cross-sections 2, 3, 4, 5, and 6 are shown in Fig. 6; the corresponding tables appear as Nos. 42–46, inclusive.

4. *Test Procedure.* — The basis for the procedure in this investigation, called the "principle of rigidity of the backwater profile," first used by Mononobe[4], may be stated briefly as follows: In a prismatic channel the shape of the backwater profile remains fixed as long as the discharge, the boundary conditions and the slope are fixed. Any change in the depth at which the water is flowing does not produce a change in the shape of the curve; it merely transfers that particular portion of the curve to a different part of the channel. As the depth of water is increased, the curve is displaced, rigidly, in the upstream direction, and another portion of the curve, characterized by a slope which is more nearly horizontal, is brought into place; as the depth of the water is decreased the curve is displaced, rigidly, in the downstream direction and another portion of the curve, characterized by a slope which is more nearly that of the channel bed, is brought into place. In neither case has any portion of the curve been altered; only a different part of the same curve has been brought under observation.

If the theoretical "step method" of computing backwater profiles such as advocated by Sevens[6] and Rouse[2], is accepted as being correct, this conception of rigidity becomes almost axiomatic. The length of the curve between any two desired values of depth is dependent only upon factors within the reach. Other reaches may be added at either the upstream end or downstream end, without in any way affecting the values computed for the first reach. Thereafter only a change in the origin of the coordinates is necessary to obtain the equivalent of the movements described in the preceding paragraph. Although the difference in procedure may make the similarity less apparent, the same reasoning may be applied to theoretical computations by such methods as those of Mononobe or Bresse.

By use of the principle of rigidity[1] the observation of a curve many times longer than the channel used becomes merely a matter of patience and careful work. It is necessary to observe any convenient portion of the curve and then, by adjustment of the backwater, transfer that portion of the curve which had been observed at one end of the channel to the other end of the channel and repeat the process. If it is desired to extend the curve downstream, the depth first

[1] This might also be called the principle of superposition.

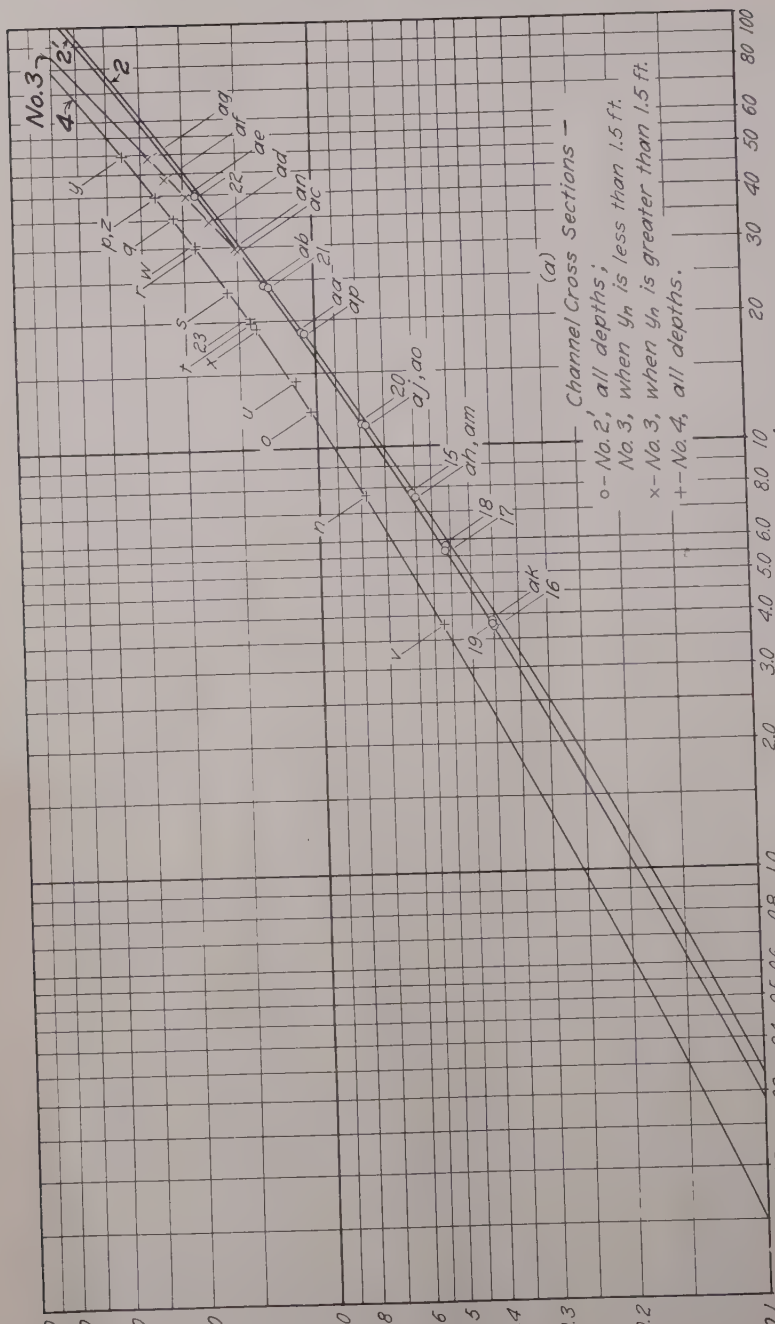
Normal Depth in Feet
Discharge in Cubic Feet per Second
(a) Channel Cross Sections —
o – No. 2, all depths;
No. 3, when yn is less than 1.5 ft.
x – No. 3, when yn is greater than 1.5 ft.
+ – No. 4, all depths.
No. 3
No. 4
No. 2

FIG. 6. RATING CURVES FOR VARIOUS OPEN CHANNEL CROSS-SECTIONS

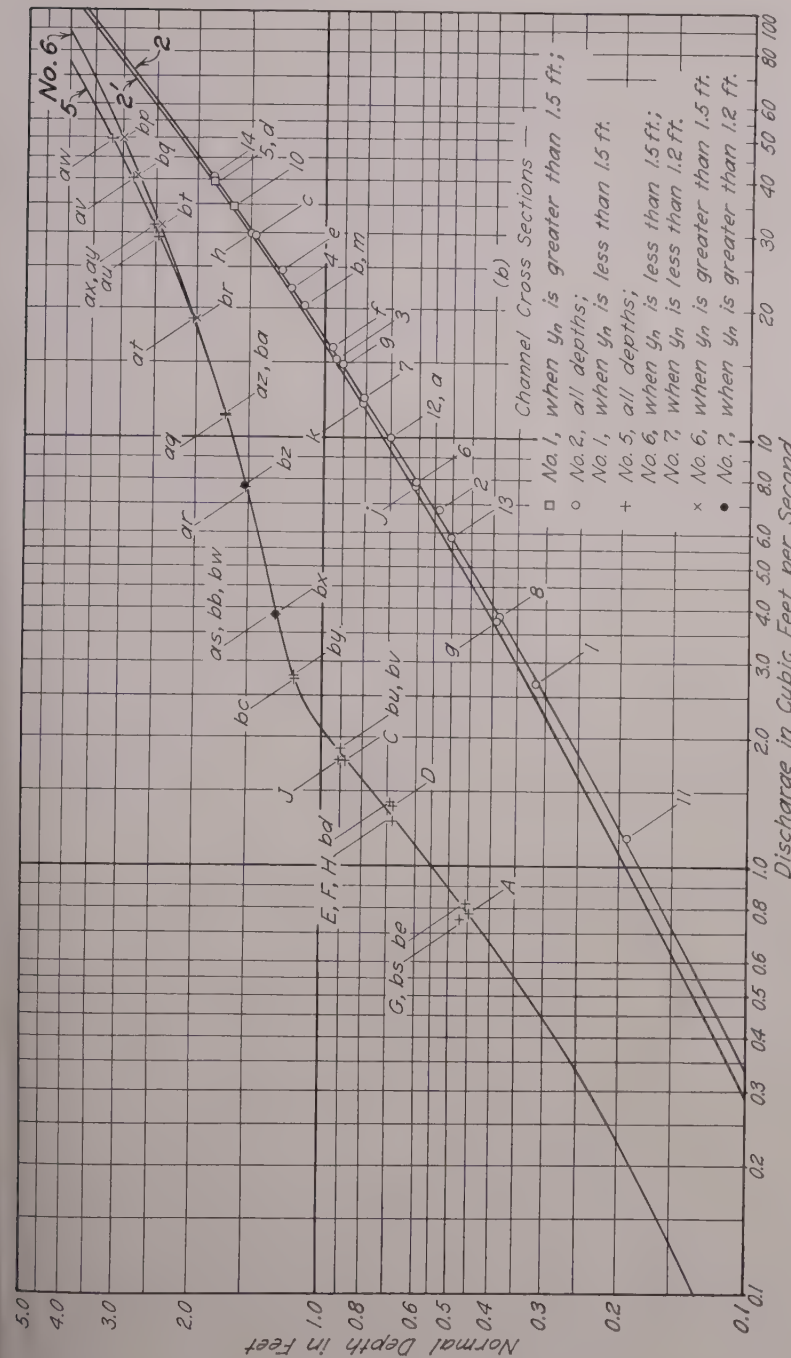

FIG. 6 (CONTINUED). RATING CURVES FOR VARIOUS OPEN CHANNEL CROSS-SECTIONS

observed at the downstream end of the channel is transferred to the upstream end. If it is desired to extend the curve upstream, the depth first observed at the upstream end is transferred to the downstream end. Continuity of stations was obtained by making, as nearly as possible, an exact duplication of depth when transferring from one end of the channel to the other. In order to decrease the possibility of error in a single end gage reading when transferring from one end of the channel to the other, an overlap of 45 ft or more was made on each test run when 10 gages were used, and 30 ft or more when 14 gages were used. For critical portions of the curves for cross-sections 5–7, the overlap was greatly increased, thereby obtaining additional

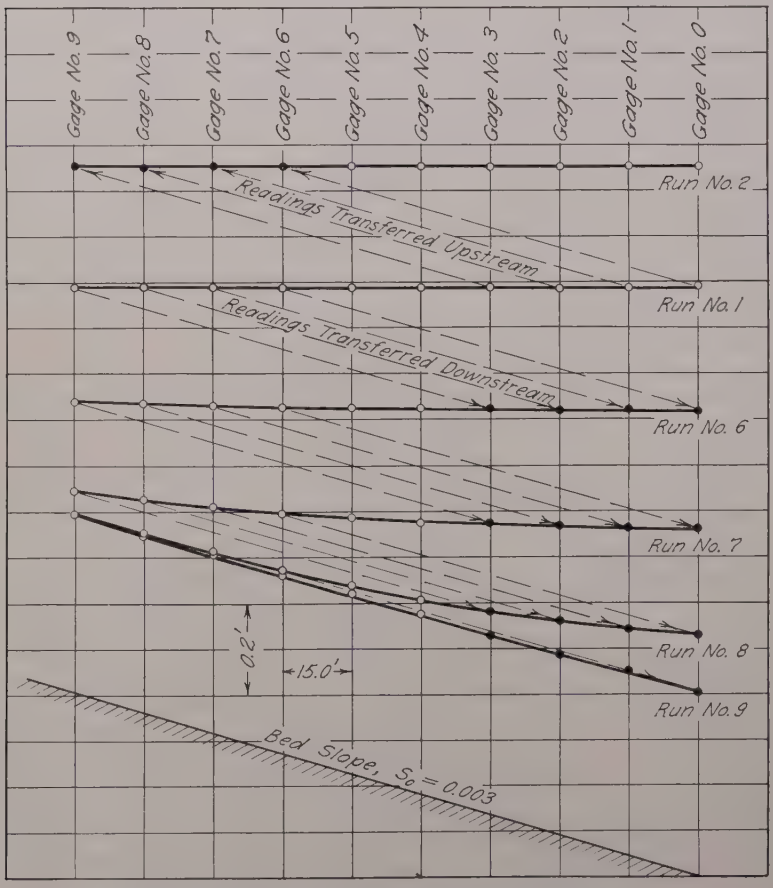

Fig. 7. Method of Projecting Backwater Curve

observations of depth at each gage. (See, for example, Table 32.) This method made it necessary to match the readings on four or more gages at one end of the channel on a test run with the readings on a corresponding number of gages at the other end of the channel on the following test run.

Because of unavoidable errors, it rarely happened that each of the four or more readings could be exactly duplicated on the transfer. This situation was met by adjusting the backwater as follows: An estimate was made for the setting of the backwater gate to give the desired reading of the four gages. After this setting had been made and the flow had been stabilized, the four gages were read and the differences from the desired values were analyzed and averaged. The backwater gate was then readjusted by the amount indicated by this average difference. This process was repeated until the indicated readjustment of the backwater gate became less than 0.005 ft. (Usually it was less than 0.002 ft.) Figure 7, which is plotted from the data for the profile for cross-section 1, $y_n = 0.386$ ft (Table 1), illustrates the method used to obtain the data for the profile curves. It will be noted that the test was started with a depth of 1.282 ft at the downstream end of the channel. The profile was then continued in a downstream direction by transferring the readings from gages 0, 1, 2, and 3 to gages 6, 7, 8, and 9 giving a depth of 1.548 ft at the downstream end of the channel. Test runs were continued downstream through No. 5 (runs 3–5 are not shown in Fig. 7) for which the depth at the downstream end of the channel was 2.358 ft, and the water surface so nearly horizontal as to represent the practical limit of the observations. Run 6 was then set up by returning to run 1 and transferring the reading from gages 6, 7, 8, and 9 to gages 0, 1, 2, and 3 giving a depth of 0.633 ft at the upstream end of the channel. The profile was then continued in the upstream direction by similar transfers, through run 9, for which the depth at the upstream end of the channel was 0.387 ft, and the water surface was so nearly parallel to the bed slope as to represent the practical limit of observation.

III. Observed Data

The essential elements of the observed data are presented in detail as Tables 1–41 and Tables 49–52. Tables 1–41 show data for the 41 observed profiles, arranged in order, first by cross-section and then by increasing values of normal depth. It will be noted that each run consists of an entry of two lines. The lower line, in large figures, is the record of gage readings, or depth of water above the bottom of the channel. The upper line, in small figures, is the stationing, or distance L, along the channel from the selected origin. Values shown here are results of a preliminary analysis by methods described on page 26. These values were not required during the progress of observations. At that time any arbitrary stationing would have served as well; or, except as a matter of convenience, the stationing could have been neglected entirely until the time of the analysis. Furthermore, the values may later be slightly reversed as a result of more detailed analysis. At the time of observation, it was necessary only to know the distance between gages, and the manner of matching, or correlating the successive runs. Near the left of the table, in a column headed BW, the upper entry represents the reading of the backwater gage, and the lower entry the setting of the crest of the backwater gate. The difference between the two (not shown in the tables) represents the static head on the crest of the movable weir which controlled the backwater.

Table 49 presents a summary of the pitometer traverses, which were used as one factor in computing the ratings for the 12-in. elbow meter and the normal depth-discharge ratings for the various open channels. It also presents a summary of the volumetric measurements by which the rating was obtained for the 24-in. elbow meter. Table 50 gives a summary of the various series of current-meter discharge measurements. More detailed information concerning these current-meter measurements is given in Table 52. Table 51 gives a summary of miscellaneous observations of differential gages and normal depths which were also used in the preparation of the ratings. Figures 13–15 depict velocity distribution in representative cross-sections.

IV. Analysis of Data

In the analysis of the data the rating, developed from volumetric discharge measurements, for the 24-in. line differential gage served as a point of departure. This rating is shown in Fig. 5. A tabulation, more convenient for use than the curve, is presented as Table 48. The current-meter measurements which were referred to this gage then were analyzed in detail, and a schedule of coefficients was developed (as used in Table 52) to best harmonize these measurements with the volumetric determinations.

Physical limitations of the laboratory apparatus prevented making volumetric measurements for rating the 12-in. line differential gage. Thus it was necessary that this rating be based on the current-meter measurements, after application of the coefficients as described above. The rating for the 12-in. elbow is as shown by Fig. 5 and in Table 47. In Table 47, however, the rating is given for a difference expressed in feet of carbon tetrachloride (CCl_4). Conversion for readings made with acetylene tetrabromide ($CHBr_2$) is obtained by multiplying the discharge by the factor 1.854; conversion for readings made with the mixture of carbon tetrachloride and gasoline (sp. gr. 1.231) is obtained by multiplying the discharge by the factor 0.6198.

Ratings were next developed for the various cross-sections of the open channel. For this purpose, normal depth readings were plotted as ordinates and discharge as abscissa as determined by one of the following methods, arranged in order of the weight which was given in drawing the curves: (1) current-meter measurements, (2) pitometer measurements, (3) discharge taken from rating for differential gages. The ratings for cross-sections 2, 3, 4, 5, and 6 are as shown in Fig. 6 and as given in Tables 42, 43, 44, 45, and 46, respectively. There has been no opportunity to develop a rating for cross-section 1; the rating for cross-section 7 appears, from available information, to be identical with that for cross-section 6.

With this information available, it now was possible to compute theoretical backwater profiles corresponding to each of the observed profiles. As explained by Rouse[2]

$$\Delta x = \frac{\Delta H}{S_o - \bar{S}}, \tag{1}$$

in which Δx is distance measured along the channel, ΔH is the difference in specific head between any two points, S_o is the bed slope, and $\bar{S}$ is the mean friction slope.

For any given discharge in the reach, $\triangle x$, between any two assumed values of depth, y, $\triangle H$ may be readily computed, since the cross-sectional area and hence the average velocity are known. Since the bed slope also is known (0.003 in these tests), the only factor to be evaluated is the friction slope. This evaluation frequently is accomplished by use of a formula, such as Manning's:

$$-dE/dx = S = \left(\frac{nV}{1.486R^{0.67}}\right)^2.$$

Such a formula has long been held to have distinct limitations. It necessitates an evaluation of n, which at best may be subject to questions and at worst becomes difficult to manipulate, as when n varies with depth. The formula takes account of the shape of the channel cross-section only to the extent to which the chosen power of the hydraulic radius is applicable. It was developed for the case of uniform flow, rather than for gradually varied flow such as is herein being considered. Fortunately, the use of such a formula is in this instance unnecessary. In place of the customary

$$V_n = \frac{1.486}{n} R^{0.67} S_o^{0.50}$$

there may be written

$$V_n = K\, S_o^{0.50}$$

or

$$K = V_n/\sqrt{S_o}, \tag{2}$$

thereby grouping all the effects of boundary characteristics into the one factor K.

In this study the values of V_n are known, or may be computed from the normal stage–discharge relation curves of Fig. 6 or the corresponding Tables 42–46. Hence, with the value of 0.003 for S_o, the values of K may be computed. It still is necessary, as before, to assume that the rate of energy loss for this gradually varied flow is the same as for uniform flow at the same depth. Under these circumstances the friction slope may be expressed as

$$S = \frac{V^2}{K^2}, \tag{3}$$

and $\bar{S}$ is merely the average of the values for S for the two ends of the reach, $\triangle x$.

Thus we have a very convenient method of computing the backwater profile. Values of the depth are taken at convenient intervals, such that the curvature of the profile between two successive points will be negligible, and the corresponding values of $\triangle x$ are computed between these points. Summation of these values of $\triangle x$ gives the total length, x, between any two desired points.

Profile computations made on this basis will be dependent upon theory, but only to the following extent:

(a) that the Bernoulli theorem, as expressed in the equation from which (1) is derived, be true, and

(b) that the rate of energy loss, or the friction slope, is a function of the square of the velocity and is the same for gradually varied flow as for uniform flow.

Since all hydraulic experience points to the accuracy of the first assumption, it appears that only the second might be open to question. Such question could best be answered by taking the laboratory data, substituting in formula (1), and solving for S. If the assumption be true, the results should agree with those of formula (3). Any substantial lack of agreement might be interpreted to indicate the extent to which the assumption might be in error.

Unfortunately, the degree of refinement required in such computations is greater than is justified by the degree of refinement of depth observations obtained in the laboratory. However, if profiles are computed by the method described above and if the laboratory data are superimposed graphically thereon, the resulting picture will give evidence of the applicability of the assumption.

By formulas (1) and (3), computations have been made corresponding to each of the observed profiles. The curves of Figs. 8, 9, 10, 11, and 12 are drawn through the points so computed. These figures also show, by the plotted points, the results of laboratory observations. In plotting these points, there once more arose the question of stationing. This was determined by matching the computed and observed data at the downstream end of the observed profiles. For each profile the computed data were plotted on the basis of depth versus L. (This plot is not shown.) Beginning with the seventh greatest observed value, and extended through the sixteenth value, the values of L corresponding to each observed depth were read from the curve. (The first six observations were not used, since there was less than normal opportunity to check them by comparison with other observations.)

The average differences between the stations so determined and the temporary arbitrary stations were computed. This difference was the correction then applied throughout the length of the profile to convert temporary stationing to stationing as shown in the profile tables. This is the stationing which has been used in the plotting of Figs. 8–12.

Emphasis should be placed on the distinction in those figures between curves and plotted points. The plotted points represent the actual observations in the laboratory. (In those cases in which, for a profile of given normal depth, two or more depth observations were obtained for the same station, the plotted point is the average of all the observations.) In computing the curves, no attempt is made to fit each to its own particular points; rather, each is computed on the basis of normal depth–discharge relation. In other words, the curves are not haphazard and unrelated; they are definite members of a common family, computed by systematic procedure from a common set of assumptions. Each curve has been computed upstream from the point at which the depth is equal to 4.00 ft to the point at which the depth is equal to 1.01 times the normal depth. The graph has been extended upstream to merge with the normal depth near the left edge of the plate. Thus, as drawn, the variations in Figs. 8–12 of the observed points from the computed profiles become a direct measure of the agreement between computation and observation.

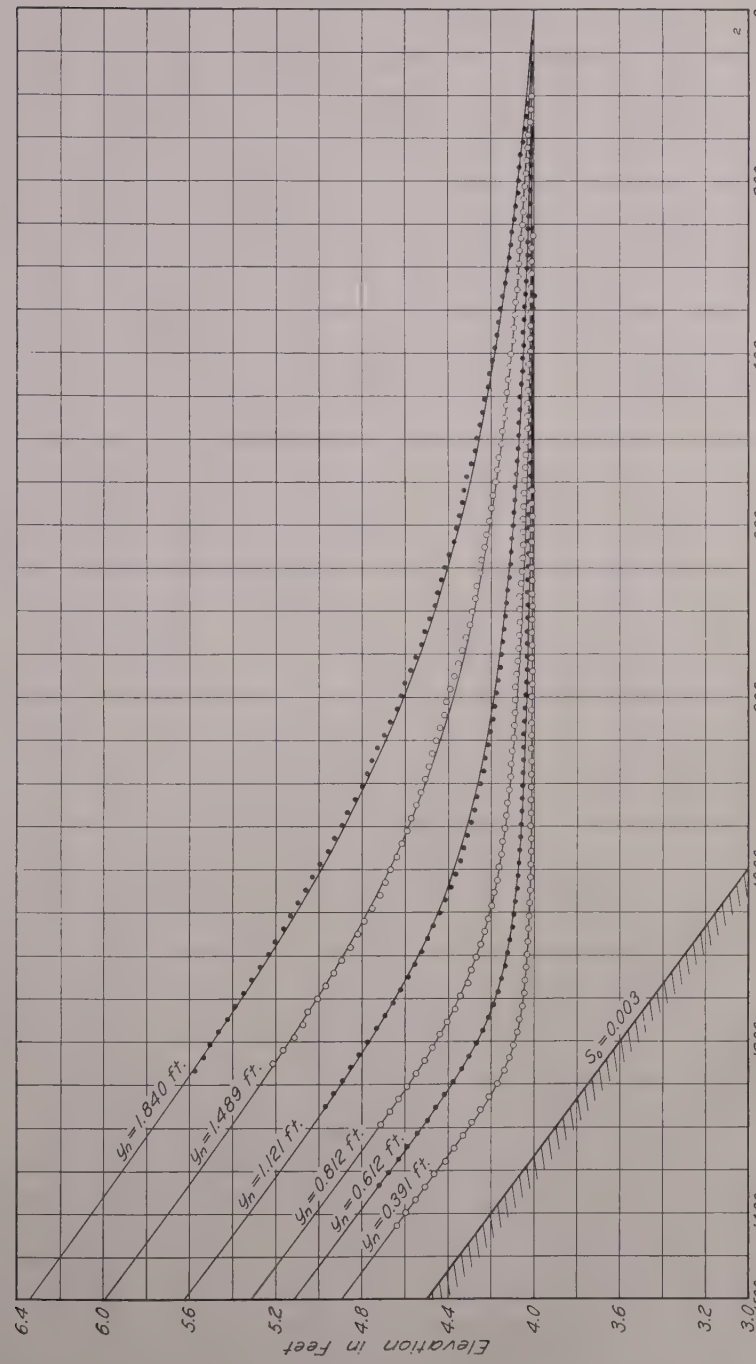

FIG. 8. BACKWATER PROFILES FOR CROSS-SECTION 2

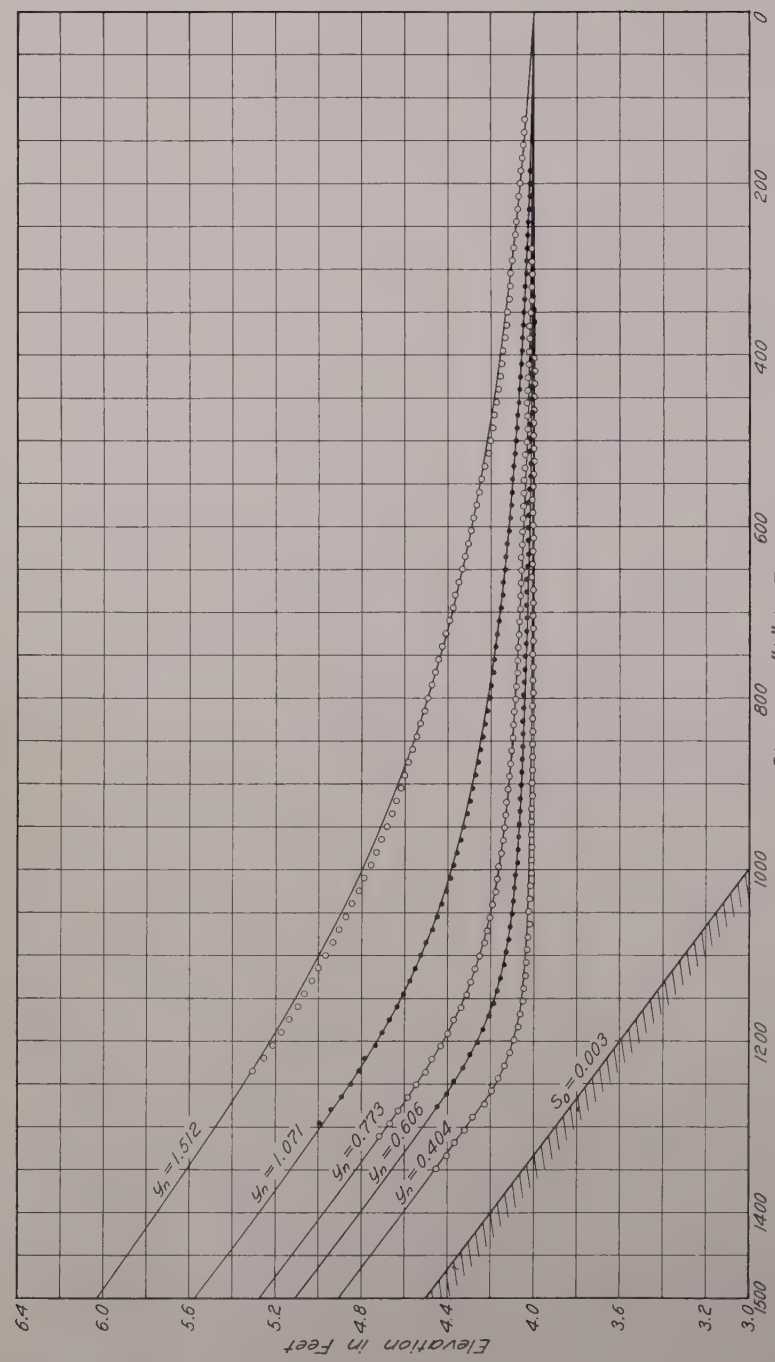

FIG. 9. BACKWATER PROFILES FOR CROSS-SECTION 3

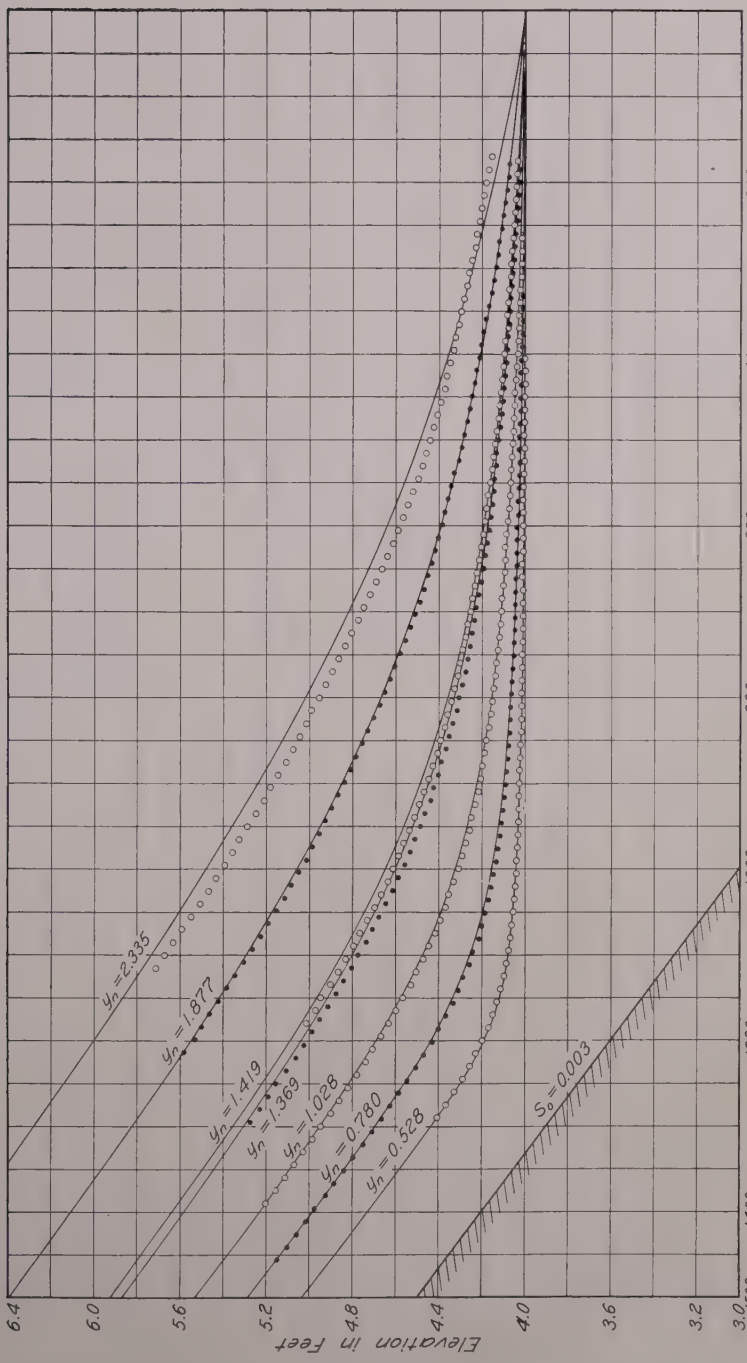

FIG. 10. BACKWATER PROFILES FOR CROSS-SECTION 4

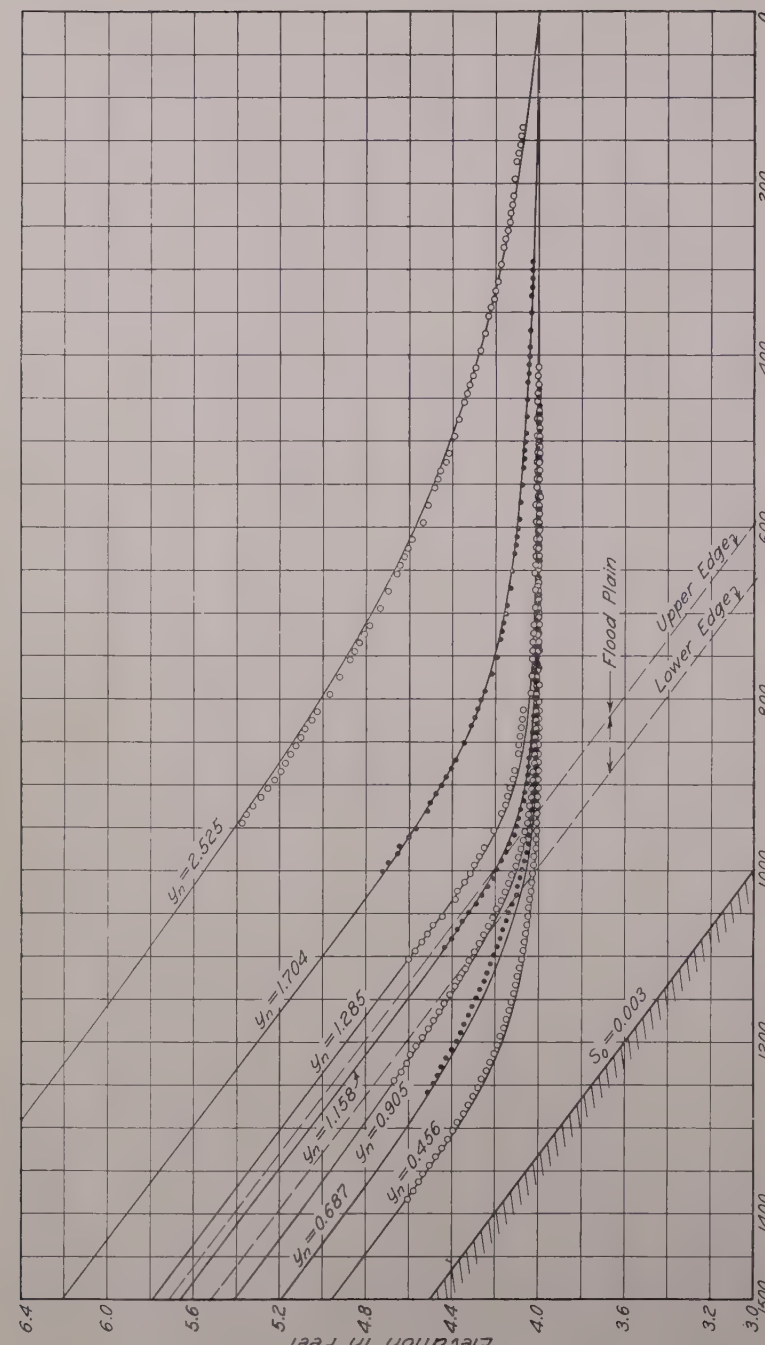

Fig. 11. Backwater Profiles for Cross-section 5

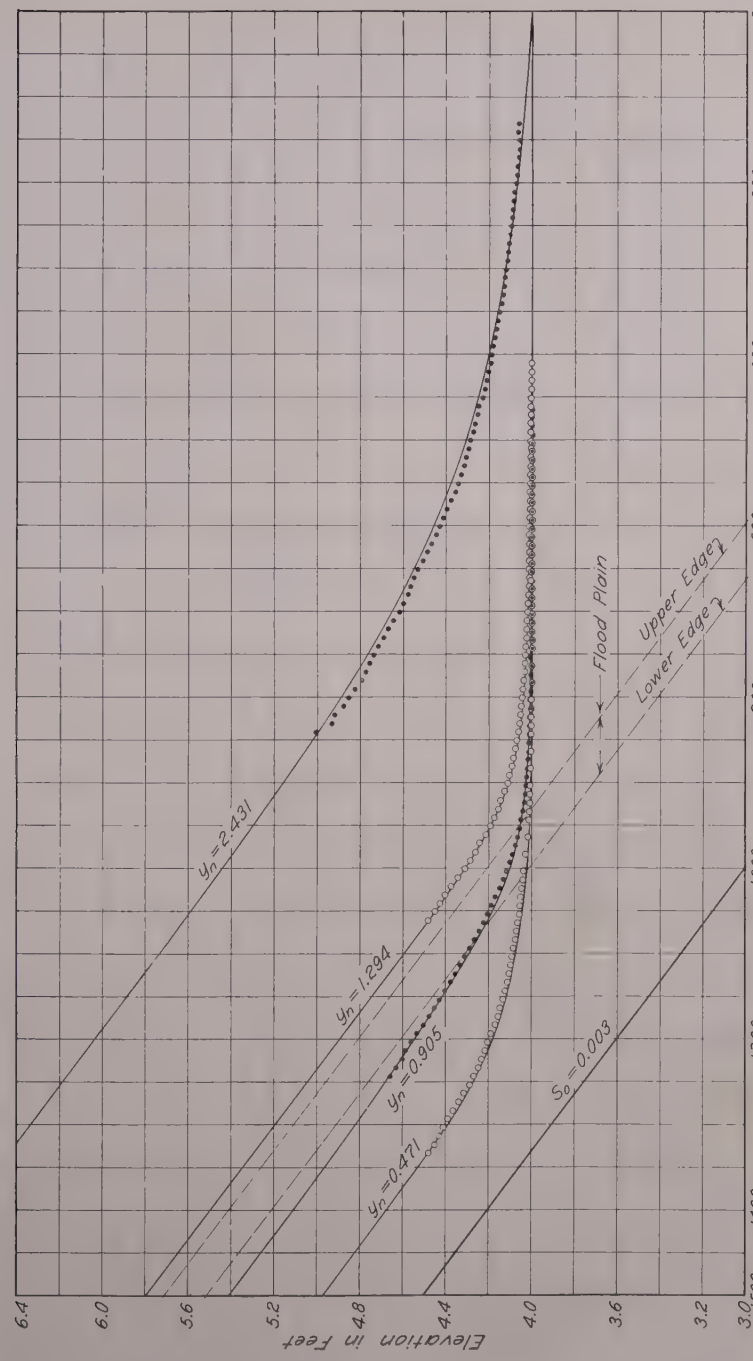

FIG. 12. BACKWATER PROFILES FOR CROSS-SECTION 6

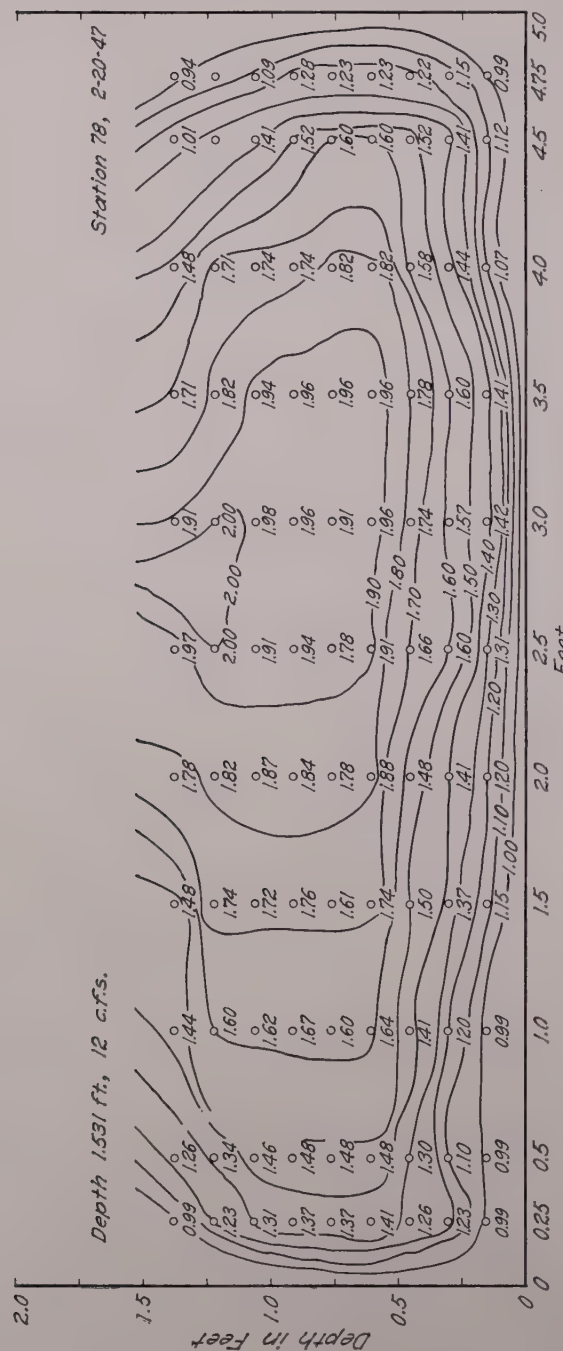

FIG. 13. VELOCITY DISTRIBUTION IN CROSS-SECTION 2

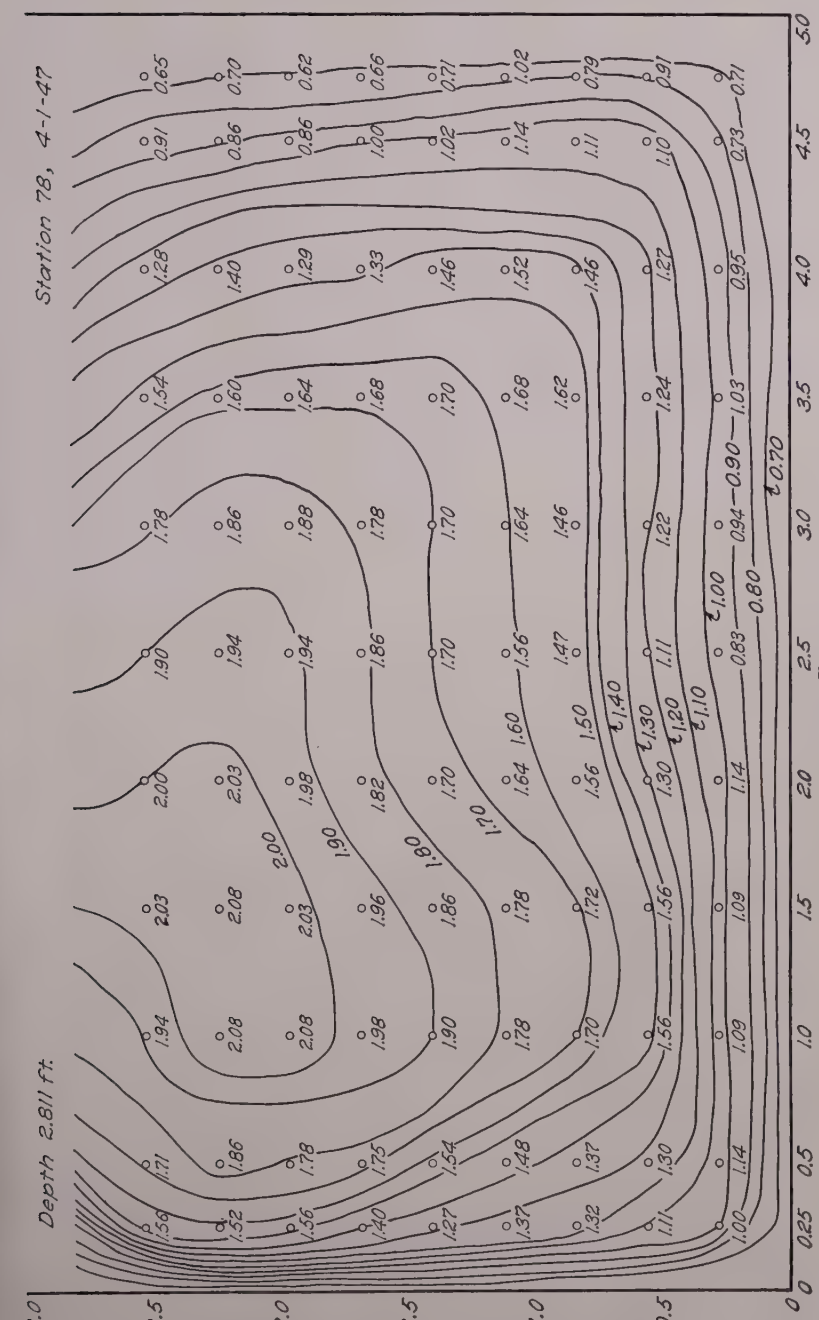

FIG. 14. VELOCITY DISTRIBUTION IN CROSS-SECTION 4

V. Discussion of Results

The minor lack of agreement between the observations and the computations may be ascribed to one or more of three causes:

(1) Appreciable error in the assumption (see page 25) that the rate of loss of energy is a function of the square of the velocity and is the same for gradually varied flow as for uniform flow.

(2) Material error in the definition of the normal stage–discharge relation, so that application of formula (2) would result in erroneous values of K.

(3) The small but ever-present possibility of observational errors in observations of the profiles.

Although such departures as that for the highest discharge of cross-section 3 (see Fig. 9) may be a reflection of observational errors, such cases are believed to be extremely few. That haphazard discrepancies are uncommon is indicated by the consistency, in cross-section 4, of the observed data for $y_n = 1.419$ ft and $y_n = 1.369$ ft. The first of these profiles (Table 27) was observed on April 1, 1947. After the differences had been noted between computed and observed data for this normal depth, the second profile (Table 26) was observed as a check upon the first. The second instance differed from the first only by about 5 per cent in discharge, but as widely as possible in observational technique; in the first instance the profile was observed continuously from maximum depth down to near normal depth, whereas in the second instance the observations were carried downward from a depth of 1.9 ft to near normal depth and then carried upward from a depth of 1.9 ft to maximum depth. Extra care was taken to insure that the flow was completely stabilized before readings were begun, and that the gages then were very carefully read. Reference to Fig. 10 makes clear that the agreement of these two observed profiles with their respective computed profiles is quite the same. It seems evident that observational error can account for only a small part of the differences.

An investigation was made to ascertain the effect on computations resulting from a variation of the normal stage–discharge relation. It was found that varying this relation did have some effect on the shape and length of the computed curves. However, no smoothly changing curve could be found for the normal stage–discharge relation which would improve the agreement as a whole and still stay within reasonable limits of the discharge measurements. It is believed that the influence of this factor has been practically eliminated.

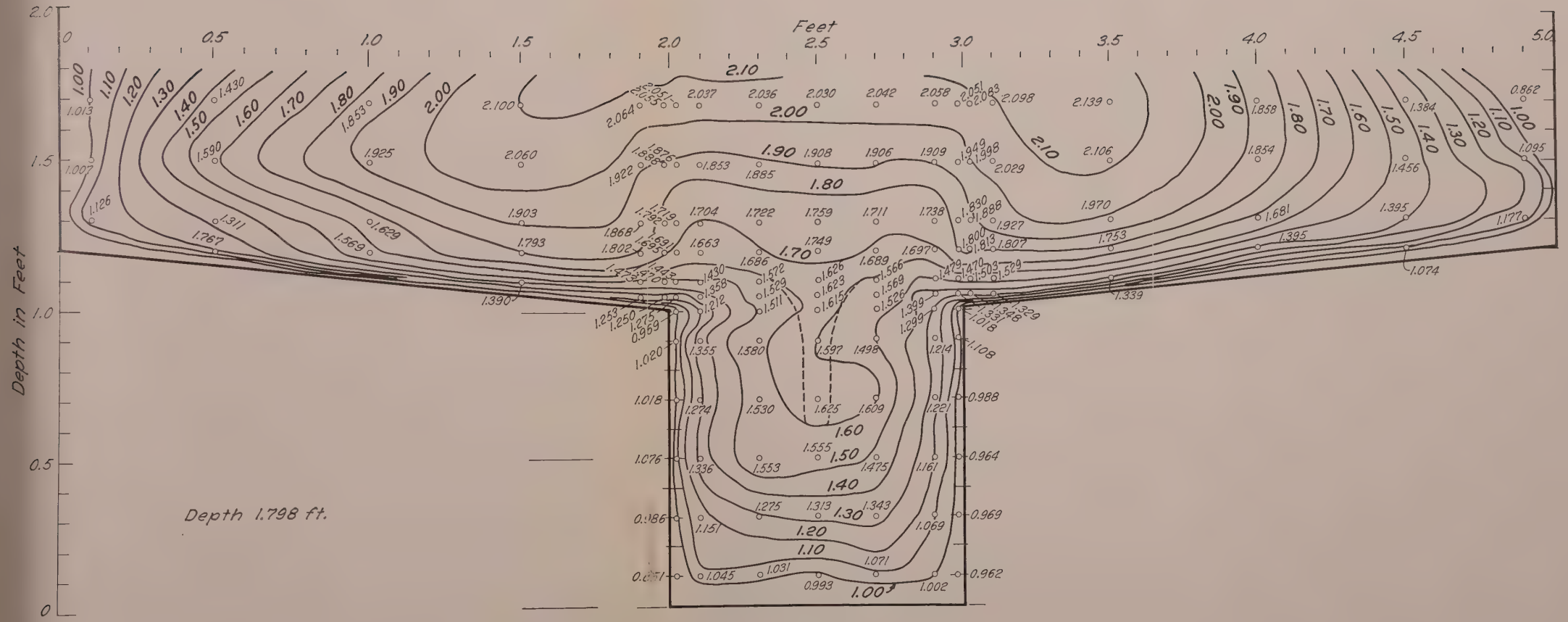

Fig. 15. Velocity Distribution in Cross-section 5

It was early noted that the agreement of observation and computation for low discharges was better than for high discharges. Since surface roughness, and hence the probable error in gage readings, increased with increase of discharge, this agrees with the thought that variations are due to observational errors. This possible solution is inconclusive, however, since it also is true that velocity increased in the same manner, so that any variation of S from a function of the square of the velocity might be reflected in increasing departure of the observed and computed data. In fact, a computation of S by substitution in formula (3) and a correlation of the results with V indicate that as V becomes low the exponent of S may become somewhat greater than 0.50. However, the points in such a plot scatter badly, and the evidence is too meager to warrant a firm conclusion.

After all, it should be noted that the differences between observed and computed results are pleasingly small. Although the possibility is not excluded that a small error may arise from the use of $S = V^2/K^2$, this definitely represents the best known approach to profile computations, and in most instances should produce satisfactory results. For those instances in which greater refinement is required than can be obtained from laboratory observation, this method of computation is recommended. In fact, further discussion of conclusions will be with reference to the computed rather than to the observed profiles.

Certain interesting observations may now be made regarding the profiles. As the discharge becomes very small, the profile approaches the limiting condition of two straight lines, one being horizontal and the other being the bed slope. These intersect at the point $x = y/S_o$, y being the depth at the point from which x is measured. For these data, this might be written $L = 4.00/0.003 = 1333$ ft. This point also may be considered the point of maximum curvature, since all the curvature occurs at this break. As the discharge increases, the profile retains this point of maximum curvature. There is, however, a decrease in the rate of curvature at this maximum point, and the point moves downstream. On the basis of incomplete studies, it appears this point of maximum curvature occurs in the vicinity of the point at which $y = 1.3\ y_n$.

In many field studies, it appears that this point of maximum curvature frequently is confused with the end of the backwater profile. There should be no basis for taking this as the upstream limit of backwater when in fact the depth just above this point may be some 20 per cent greater than normal. In the computations herein presented the end of the backwater is taken as the point at which y becomes

1.01 y_n. Each of the profiles has been computed to this point. In the rectangular channels, it will be noted that this point is at station 1333 for zero discharge, but moves gradually downstream to about station 1300 for normal depths of about 0.5 ft. Thereafter it moves in the upstream direction as the discharge is increased, and moves a greater distance for the channels of greater roughness. For the flood-plain channels, this upstream end of backwater is at station 1333 for zero discharge, and appears to move gradually upstream to about station 1390 for normal depth of about 0.70 ft. Thereafter it moves in the downstream direction — slowly at first, but very abruptly as the normal depth is increased to a value above the elevation of the flood plain. Let it be emphasized that these lengths are computed from the starting value of $y = 4.00$ ft, rather than from the variable depth which would exist if the discharge were forced to pass over a fixed-height structure such as a spillway.

It is anticipated that the United States Geological Survey will make a further analysis of these data, looking toward the determination of the stage-fall-discharge relationships.

Selected Bibliography

1. Bakhmeteff, B. A. — Hydraulics of Open Channels, McGraw-Hill Book Company, New York, New York.
2. Rouse, H. — Fluid Mechanics for Hydraulic Engineers, McGraw-Hill Book Company, New York, New York.
3. Woodward, S. M., and Posey, C. J. — Steady Flow in Open Channels, John Wiley and Sons, New York, New York.
4. Mononobe, N. — "Backwater and Dropdown Curves for Uniform Channels," A.S.C.E. Trans., Vol. 103. 1938.
5. Lansford, W. M. — "The Use of an Elbow in a Pipe Line for Determining the Rate of Flow in the Pipe Line," Univ. of Ill. Eng. Exp. Sta. Bul. 289. 1936.
6. Stevens, J. C. — "Computing Backwater Curves for Surface Slopes in Streams," Eng. News-Record, Vol. 95, No. 14. Oct. 1, 1925.
7. Mitchell, W. D., and Barron, E. G. — "The Backwater Profile for Steady Flow in a Rectangular Channel and Its Significance in the Stage-Fall-Discharge Relation," University of Illinois Graduate Thesis (unpub.). 1946.

TABLES

TABLE 1

BACKWATER PROFILE, CROSS-SECTION 1

Date: June 23, 1944 Discharge: 3.82 second-feet Normal depth: 0.386 feet

HOUR	BW[a]	GAGE IDENTIFICATION 0	1	2	3	4	5	6	7	8	9	Diff.	RUN NO.
	0.386	NORMAL DEPTH READINGS--NO BACKWATER											
5:15 pm	-----	0.387	0.382	0.390	0.384	0.379	0.386	0.389	0.383	0.391	0.389		0
		BACKWATER PROFILE											
	2.359	552	567	582	597	612	627	642	657	672	687		QM
8:20	2.100	2.358	2.310	1.266	2.266	2.178	2.132	2.088	2.045	1.996	1.952	d0.44	5
	2.084	642	657	672	687	702	717	732	747	762	777		
7:45	1.823	2.089	2.041	1.997	1.952	1.908	1.862	1.818	1.774	1.728	1.684	e1.47	4
	1.815	732	747	762	777	792	807	822	837	852	867		QM
6:30	1.528	1.821	1.776	1.730	1.684	1.640	1.594	1.548	1.505	1.459	1.414	d0.44	3
	1.543	822	837	852	867	882	897	912	927	942	957		
6:00	1.262	1.548	1.501	1.456	1.411	1.367	1.322	1.278	1.234	1.187	1.146	d0.44	2
	1.278	912	927	942	957	972	987	1002	1017	1032	1047		QM
5:40	0.993	1.282	1.235	1.189	1.146	1.102	1.057	1.012	0.970	0.926	0.882	d0.44	1
	1.011	1002	1017	1032	1047	1062	1077	1092	1107	1122	1137		
10:50	0.722	1.013	0.970	0.928	0.882	0.840	0.798	0.754	0.714	0.675	0.633	e1.48	6
	0.754	1092	1107	1122	1137	1152	1167	1182	1197	1212	1227		
11:15	0.458	0.756	0.713	0.674	0.633	0.593	0.557	0.523	0.493	0.465	0.439	d0.44	7
	0.522	1182	1197	1212	1227	1242	1257	1272	1287	1302	1317		
11:40	0.223	0.523	0.493	0.466	0.441	0.420	0.411	0.400	0.397	0.391	0.387	e1.49	8
am	0.398	1272	1287	1302	1317	1332	1347	1362	1377	1392	1407		QM
12:05	0.102	0.400	0.403	0.392	0.390	0.393	0.394	0.390	0.391	0.388	0.387	d0.45	9

---

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [d] *Data for $2CHBr_2$ gage, 12-inch line.* [e] *Data for CCl_4 gage, 12-inch line. QM indicates a series of discharge measurements.*

TABLE 2

BACKWATER PROFILE, CROSS-SECTION 1

Date: August 29, 1944 Discharge: 5.89 second-feet Normal depth: 0.504 feet

HOUR and TEMP.	GAGE IDENTIFICATION												RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
	0.504	NORMAL DEPTH READINGS--NO BACKWATER											
2:10 pm	0.075	0.501	0.510	0.504	0.504	0.500	0.507	0.506	0.506	0.504	0.502	e3.35	0
	BACKWATER PROFILE												
73°	1.855	720	735	750	765	780	795	810	825	840	855		
3:15	1.455	1.855	1.810	1.763	1.720	1.675	1.630	1.588	1.545	1.500	1.457	e3.37	1
73°	1.591	810	825	840	855	870	885	900	915	930	945		QM
3:50	1.182	1.589	1.545	1.500	1.457	1.414	1.370	1.328	1.285	1.241	1.199	e3.34	2
73°	1.330	900	915	930	945	960	975	990	1005	1020	1035		
5:30	0.892	1.328	1.287	1.242	1.199	1.157	1.114	1.071	1.029	0.986	0.945	e3.36	3
74°	1.073	990	1005	1020	1035	1050	1065	1080	1095	1110	1125		
6:30	0.630	1.071	1.030	0.985	0.945	0.904	0.864	0.823	0.786	0.748	0.711	e3.36	4
74°	0.987	1020	1035	1050	1065	1080	1095	1110	1125	1140	1155		
6:55	0.545	0.987	0.946	0.902	0.864	0.823	0.785	0.746	0.712	0.678	0.648	e3.37	5
74°	0.905	1050	1065	1080	1095	1110	1125	1140	1155	1170	1185		
7:25	0.467	0.903	0.865	0.823	0.787	0.748	0.713	0.677	0.649	0.619	0.592	e3.38	6
74°	0.826	1080	1095	1110	1125	1140	1155	1170	1185	1200	1215		
7:45	0.390	0.823	0.790	0.749	0.715	0.678	0.651	0.619	0.595	0.571	0.553	e3.37	7
75°	0.749	1110	1125	1140	1155	1170	1185	1200	1215	1230	1245		
8:10	0.315	0.748	0.715	0.678	0.651	0.618	0.596	0.572	0.555	0.541	0.527	e3.35	8
75°	0.681	1140	1155	1170	1185	1200	1215	1230	1245	1260	1275		
8:40	0.246	0.678	0.653	0.619	0.596	0.571	0.557	0.541	0.531	0.522	0.514	e3.37	9
75°	0.620	1170	1185	1200	1215	1230	1245	1260	1275	1290	1305		
9:00	0.187	0.618	0.596	0.571	0.558	0.536	0.530	0.522	0.518	0.513	0.507	e3.37	10
75°	0.573	1200	1215	1230	1245	1260	1275	1290	1305	1320	1335		
9:15	0.140	0.572	0.560	0.540	0.531	0.521	0.519	0.514	0.512	0.508	0.506	e3.37	11
76°	0.543	1230	1245	1260	1275	1290	1305	1320	1335	1350	1365		
9:40	0.108	0.539	0.536	0.523	0.518	0.511	0.512	0.508	0.510	0.507	0.504	e3.38	12
76°	0.524	1260	1275	1290	1305	1320	1335	1350	1365	1380	1395		
10:00	0.091	0.522	0.522	0.513	0.511	0.508	0.510	0.507	0.508	0.505	0.504	e3.39	13

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [e] *Data for CCl_4 gage, 12-inch line. QM indicates a series of discharge measurements.*

TABLE 3

BACKWATER PROFILE, CROSS-SECTION 1

Date: May 20, 1944 Discharge: 7.95 second-feet Normal depth: 0.610 feet

HOUR	BW[a]	GAGE IDENTIFICATION 0	1	2	3	4	5	6	7	8	9	Diff.	RUN NO.
	0.610	NORMAL DEPTH READINGS--NO BACKWATER											QM
7:15 pm		0.612	0.616	0.610	0.610	0.606	0.612	0.609	0.610	0.609	0.612	d1.87	0
		BACKWATER PROFILE											
	1.868	718	733	748	763	778	793	808	823	838	853		QM
12:30 am		1.867	1.822	1.779	1.734	1.690	1.650	1.606	1.563	1.519	1.475	d1.88	6
	1.610	808	823	838	853	868	883	898	913	928	943		
11:55 pm		1.609	1.562	1.516	1.475	1.431	1.392	1.348	1.306	1.263	1.221		5
	1.350	898	913	928	943	958	973	988	1003	1018	1033		QM
10:50		1.348	1.304	1.261	1.220	1.177	1.139	1.098	1.059	1.018	0.980		4
	1.097	988	1003	1018	1033	1048	1063	1078	1093	1108	1123		
10:00		1.097	1.058	1.017	0.979	0.938	0.906	0.868	0.834	0.805	0.776		3
	0.870	1078	1093	1108	1123	1138	1153	1168	1183	1198	1213		
9:15		0.869	0.836	0.804	0.773	0.741	0.718	0.696	0.683	0.664	0.652	d1.88	2
	0.700	1168	1183	1198	1213	1228	1243	1258	1273	1288	1303		
8:30		0.702	0.684	0.668	0.651	0.633	0.631	0.620	0.622	0.613	0.619		1

[a] *Water surface reading of backwater gage.* [d] *Data for 2CHBr$_2$ gage, 12-inch line. QM indicates a series of discharge measurements.*

TABLE 4

BACKWATER PROFILE, CROSS-SECTION 1

Date: May 29, 1944 Discharge: 9.91 second-feet Normal depth: 0.703 feet

HOUR	BW[a]	GAGE IDENTIFICATION 0	1	2	3	4	5	6	7	8	9	Diff.	RUN NO.
	0.694	NORMAL DEPTH READINGS--NO BACKWATER											
5:45 pm		0.700	0.706	0.703	0.705	0.698	0.705	0.702	0.704	0.702	0.702	d3.02	0
		BACKWATER PROFILE											
	2.141	625	640	655	670	685	700	715	730	745	760		
9:20		2.140	2.096	2.054	2.009	1.965	1.924	1.877	1.833	1.789	1.742	d3.00	7
	1.878	715	730	745	760	775	790	805	820	835	850		
8:30		1.878	1.834	1.786	1.746	1.700	1.663	1.616	1.574	1.533	1.488		6
	1.620	805	820	835	850	865	880	895	910	925	940		
8:00		1.619	1.574	1.531	1.487	1.445	1.407	1.362	1.323	1.280	1.243		5
	1.364	895	910	925	940	955	970	985	1000	1015	1030		
7:35		1.363	1.322	1.279	1.239	1.197	1.162	1.120	1.083	1.049	1.013		4
	1.120	985	1000	1015	1030	1045	1060	1075	1090	1105	1120		
6:55		1.120	1.083	1.049	1.012	0.968	0.939	0.905	0.882	0.850	0.829	d3.02	3
	0.900	1075	1090	1105	1120	1135	1150	1165	1180	1195	1210		
6:25		0.904	0.879	0.852	0.828	0.798	0.782	0.764	0.754	0.742	0.732		2
	0.757	1165	1180	1195	1210	1225	1240	1255	1270	1285	1300		
6:05		0.764	0.754	0.741	0.731	0.719	0.720	0.713	0.710	0.706	0.704		1

[a] Water surface reading of backwater gage. [d] Data for $2CHBr_2$ gage, 12-inch line.

TABLE 5

BACKWATER PROFILE, CROSS-SECTION 1

Date: May 23, 1944 Discharge: 12.33 second-feet Normal depth: 0.810 feet

HOUR	BW[a']	GAGE IDENTIFICATION 0	1	2	3	4	5	6	7	8	9	Diff.	RUN NO.
	0.811	NORMAL DEPTH READINGS--NO BACKWATER											QM
6:30 pm		0.811	0.811	0.810	0.809	0.802	0.810	0.810	0.811	0.810	0.813	d4.44	0
		BACKWATER PROFILE											
	2.382	545	560	575	590	605	620	635	650	665	680		
11:45		2.380	2.338	2.292	2.250	2.208	2.166	2.124	2.080	2.038	1.996	d4.45	8
	2.124	635	650	665	680	695	710	725	740	755	770		QM
10:45		2.125	2.081	2.040	1.998	1.955	1.911	1.865	1.822	1.781	1.738		7
	1.865	725	740	755	770	785	800	815	830	845	860		
10:10		1.864	1.823	1.780	1.739	1.699	1.653	1.614	1.574	1.529	1.483		6
	1.614	815	830	845	860	875	890	905	920	935	950		QM
9:10		1.613	1.572	1.528	1.486	1.445	1.410	1.368	1.330	1.297	1.260	d4.46	5
	1.371	905	920	935	950	965	980	995	1010	1025	1040		
8:50		1.371	1.333	1.297	1.258	1.219	1.184	1.147	1.116	1.088	1.052		4
	1.150	995	1010	1025	1040	1055	1070	1085	1100	1115	1130		
8:30		1.149	1.115	1.083	1.047	1.019	0.994	0.964	0.943	0.921	0.903		3
	0.962	1085	1100	1115	1130	1145	1160	1175	1190	1205	1220		
8:10		0.964	0.944	0.922	0.901	0.881	0.867	0.856	0.848	0.840	0.832		2
	0.860	1175	1190	1205	1220	1235	1250	1265	1280	1295	1310		
7:20		0.860	0.848	0.839	0.831	0.825	0.822	0.818	0.816	0.812	0.815	d4.44	1

[a'] *Water surface reading of backwater gage.* [d] *Data for $2CHBr_2$ gage, 12-inch line.*

QM indicates a series of discharge measurements.

TABLE 6

BACKWATER PROFILE, CROSS-SECTION 1

Date: August 24, 1944 Discharge: 15.93 second-feet Normal depth: 0.958 feet

HOUR and TEMP.	GAGE IDENTIFICATION												RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
	0.963	NORMAL DEPTH READINGS--NO BACKWATER											
2:55 pm	0.085	0.958	0.963	0.961	0.960	0.953	0.956	0.954	0.957	0.960	0.962	b0.520	0
	BACKWATER PROFILE												
76°	2.932	360	375	390	405	420	435	450	465	480	495		
4:40	2.03	2.931	2.888	2.843	2.801	2.760	2.717	2.673	2.629	2.587	2.544	b0.530	1
76°	2.674	450	465	480	495	510	525	540	555	570	585		
5:20	1.765	2.672	2.630	2.586	2.546	2.503	2.462	2.420	2.378	2.336	2.291	b0.530	2
77°	2.418	540	555	570	585	600	615	630	645	660	675		
6:05	1.54	2.419	2.379	2.334	2.291	2.250	2.210	2.169	2.128	2.086	2.044	b0.530	3
77°	2.171	630	645	660	675	690	705	720	735	750	765		
6:40	1.275	2.170	2.129	2.088	2.047	2.007	1.965	1.924	1.883	1.842	1.803	b0.530	4
78°	1.924	720	735	750	765	780	795	810	825	840	855		
7:15	1.005	1.923	1.882	1.842	1.803	1.763	1.723	1.684	1.644	1.604	1.565	b0.530	5
78°	1.685	810	825	840	855	870	885	900	915	930	945		
8:20	0.775	1.682	1.644	1.604	1.565	1.526	1.488	1.449	1.410	1.373	1.341	b0.540	6
78°	1.451	900	915	930	945	960	975	990	1005	1020	1035		
9:00	0.545	1.448	1.411	1.375	1.342	1.307	1.277	1.247	1.218	1.190	1.164	b0.530	7
78°	1.250	990	1005	1020	1035	1050	1065	1080	1095	1110	1125		
9:25	0.355	1.247	1.218	1.191	1.165	1.140	1.117	1.094	1.073	1.056	1.042	b0.530	8
79°	1.092	1080	1095	1110	1125	1140	1155	1170	1185	1200	1215		
10:15	0.208	1.093	1.073	1.056	1.041	1.026	1.016	1.007	0.998	0.989	0.985	b0.530	9
79°	1.007	1170	1185	1200	1215	1230	1245	1260	1275	1290	1305		
10:45	0.125	1.006	0.997	0.990	0.985	0.977	0.973	0.969	0.967	0.966	0.966	b0.530	10

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [b] *Data for $2CHBr_2$ gage, 24-inch line.*

TABLE 7

BACKWATER PROFILE, CROSS-SECTION 1

Date: July 10, 1944 Discharge: 20.10 second-feet Normal depth: 1.120 feet

HOUR	GAGE IDENTIFICATION											Diff.	RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9		
	1.120	NORMAL DEPTH READINGS--NO BACKWATER											
7:00 pm	-----	1.120	1.122	1.118	1.120	1.118	1.121	1.120	1.120	1.122	1.120	b0.834	0
	BACKWATER PROFILE												
	3.478	175	190	205	220	235	250	265	280	295	310		
8:45	2.43	3.480	3.430	3.392	3.346	3.300	3.259	3.215	3.169	3.122		b0.824	1
	3.214	265	280	295	310	325	340	355	370	385	400		
9:30	2.13	3.215	3.169	3.124	3.087	3.042	2.998	2.954	2.908	2.865	2.823	b0.828	2
	2.955	355	370	385	400	415	430	445	460	475	490		
10:05	1.86	2.955	2.912	2.867	2.830	2.788	2.738	2.692	2.652	2.612	2.571	b0.830	3
	2.681	445	460	475	490	505	520	535	550	565	580		
10:30	1.59	2.697	2.652	2.614	2.564	2.522	2.479	2.434	2.398	2.356	2.314	b0.834	4
	2.437	535	550	565	580	595	610	625	640	655	670		
11:25	1.34	2.437	2.398	2.356	2.316	2.278	2.230	2.188	2.144	2.106	2.073	b0.830	5
	2.188	625	640	655	670	685	700	715	730	745	760		
11:55	1.08	2.187	2.148	2.106	2.064	2.028	1.984	1.945	1.903	1.870	1.832	b0.834	6
am	1.940	715	730	745	760	775	790	805	820	835	850		
12:25	0.84	1.946	1.904	1.863	1.824	1.790	1.751	1.714	1.676	1.640	1.608	b0.840	7
	1.710	805	820	835	850	865	880	895	910	925	940		
12:55	0.59	1.713	1.677	1.642	1.607	1.574	1.545	1.514	1.485	1.450	1.436	b0.840	8
	1.514	895	910	925	940	955	970	985	1000	1015	1030		
1:30	0.41	1.515	1.485	1.455	1.430	1.401	1.373	1.348	1.327	1.311	1.290	b0.840	9
	1.348	985	1000	1015	1030	1045	1060	1075	1090	1105	1120		
1:50	0.24	1.349	1.332	1.304	1.285	1.260	1.245	1.234	1.223	1.216	1.209	b0.840	10
	1.235	1075	1090	1105	1120	1135	1150	1165	1180	1195	1210		
2:15	0.12	1.234	1.232	1.212	1.201	1.186	1.181	1.165	1.162	1.147	1.151	b0.840	11
	1.164	1165	1180	1195	1210	1225	1240	1255	1270	1285	1300		
3:00	0.05	1.170	1.165	1.152	1.148	1.138	1.136	1.134	1.135	1.130	1.128	b0.840	12

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [b] *Data for $2CHBr_2$ gage, 24-inch line.*

TABLE 8

BACKWATER PROFILE, CROSS-SECTION 1

Date: August 15,1944 Discharge: 23.86 second-feet Normal depth: 1.260 feet

HOUR and TEMP.	GAGE IDENTIFICATION											Diff.	RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9		
	1.262				NORMAL DEPTH READINGS--NO BACKWATER								
2:50 pm	0.11	1.260	1.268	1.259	1.260	1.257	1.263	1.250	1.260	1.260	1.262	b1.20	0
					BACKWATER PROFILE								
79°	3.475	178	193	208	223	238	253	268	283	298	313		
4:20	2.242	3.477	3.430	3.389	3.344	3.302	3.257	3.214	3.168	3.123	3.090	b1.22	1
	3.213	268	283	298	313	328	343	358	373	388	403		
4:45	1.97	3.215	3.170	3.123	3.080	3.037	2.996	2.953	2.904	2.863	2.819	b1.24	2
	2.954	358	373	388	403	418	433	448	463	478	493		
5:10	1.715	2.955	2.903	2.863	2.820	2.778	2.735	2.697	2.649	2.605	2.564	b1.24	3
80°	2.695	448	463	478	493	508	523	538	553	568	583		
5:40	1.48	2.700	2.652	2.606	2.561	2.527	2.490	2.449	2.403	2.354	2.312	b1.26	4
	2.449	538	553	568	583	598	613	628	643	658	673		
6:30	1.225	2.446	2.403	2.358	2.316	2.278	2.240	2.200	2.158	2.120	2.080	b1.24	5
81°	2.201	628	643	658	673	688	703	718	733	748	763		
7:00	0.97	2.201	2.160	2.116	2.082	2.042	2.005	1.967	1.931	1.901	1.864	b1.24	6
	1.967	718	733	748	763	778	793	808	823	838	853		
8:00	0.75	1.966	1.930	1.895	1.860	1.825	1.788	1.755	1.721	1.689	1.666	b1.22	7
81°	1.754	808	823	838	853	868	883	898	913	928	943		
8:25	0.552	1.755	1.721	1.690	1.660	1.628	1.601	1.572	1.545	1.523	1.497	b1.22	8
	1.570	898	913	928	943	958	973	988	1003	1018	1033		
9:00	0.382	1.571	1.548	1.522	1.499	1.475	1.451	1.431	1.421	1.399	1.389	b1.22	9
82°	1.434	988	1003	1018	1033	1048	1063	1078	1093	1108	1123		
9:25	0.245	1.431	1.421	1.402	1.387	1.362	1.352	1.342	1.332	1.327	1.323	b1.22	10
	1.343	1078	1093	1108	1123	1138	1153	1168	1183	1198	1213		
9:50	0.169	1.342	1.336	1.329	1.325	1.316	1.302	1.296	1.290	1.287	1.284	b1.22	11
82°	1.294	1168	1183	1198	1213	1228	1243	1258	1273	1288	1303		
10:10	0.120	1.296	1.293	1.287	1.283	1.279	1.277	1.275	1.273	1.268	1.265	b1.22	12

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [b] *Data for $2CHBr_2$ gage, 24-inch line.*

TABLE 9

BACKWATER PROFILE, CROSS-SECTION 1

Date: July 12, 1944 Discharge: 29.41 second-feet Normal depth: 1.460 feet

HOUR and TEMP.	GAGE IDENTIFICATION												RUN NO.
	Bw[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
81°	1.455	NORMAL DEPTH READINGS--NO BACKWATER											
4:45 pm	-----	1.460	1.458	1.463	1.456	1.457	1.463	1.458	1.458	1.463	1.462	b1.800	0
	BACKWATER PROFILE												
81°	3.74	88	103	118	133	148	163	178	193	208	223		
5:35	2.32	3.740	3.688	3.647	3.610	3.568	3.527	3.482	3.439	3.396	3.347	b1.810	1
	3.48	178	193	208	223	238	253	268	283	298	313		
6:20	2.05	3.482	3.442	3.397	3.352	3.317	3.272	3.227	3.185	3.144	3.106	b1.800	2
81°	3.228	268	283	298	313	328	343	358	373	388	403		
7:00	1.78	3.228	3.183	3.141	3.103	3.055	3.017	2.973	2.934	2.887	2.847	b1.805	3
81°	2.968	358	373	388	403	418	433	448	463	478	493		
8:40	1.53	2.974	2.931	2.886	2.847	2.808	2.762	2.727	2.691	2.651	2.610	b1.800	4
	2.724	448	463	478	493	508	523	538	553	568	583		
9:30	1.30	2.723	2.684	2.649	2.610	2.573	2.533	2.490	2.448	2.410	2.371	b1.800	5
82°	2.481	538	553	568	583	598	613	628	643	658	673		
10:00	1.085	2.489	2.450	2.407	2.373	2.343	2.307	2.270	2.231	2.195	2.158	b1.800	6
83°	2.270	628	643	658	673	688	703	718	733	748	763		
10:50	0.83	2.266	2.225	2.191	2.159	2.123	2.080	2.053	2.018	1.988	1.955	b1.800	7
	2.050	718	733	748	763	778	793	808	823	838	853		
11:30	0.63	2.054	2.020	1.988	1.951	1.924	1.892	1.859	1.830	1.801	1.772	b1.800	8
am	1.856	808	823	838	853	868	883	898	913	928	943		
12:30	0.465	1.860	1.830	1.798	1.773	1.741	1.724	1.696	1.681	1.663	1.642	b1.795	9
	1.694	898	913	928	943	958	973	988	1003	1018	1033		
1:10	0.31	1.695	1.681	1.665	1.649	1.623	1.610	1.594	1.579	1.558	1.546	b1.790	10
84°	1.593	988	1003	1018	1033	1048	1063	1078	1093	1108	1123		
1:50	0.205	1.594	1.580	1.566	1.557	1.545	1.529	1.521	1.515	1.513	1.509	b1.780	11
83°	1.520	1078	1093	1108	1123	1138	1153	1168	1183	1198	1213		
2:20	0.133	1.522	1.518	1.508	1.494	1.493	1.487	1.482	1.480	1.480	1.482	b1.790	12

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [b] *Data for $2CHBr_2$ gage, 24-inch line.*

TABLE 10

BACKWATER PROFILE, CROSS-SECTION 1

Date: July 24, 1944 Discharge: 34.77 second-feet Normal depth: 1.648 feet

HOUR and TEMP.	B.W.[a]	0	1	2	3	4	5	6	7	8	9	Diff.	RUN NO.
	1.648				NORMAL DEPTH READINGS--NO BACKWATER								
2:30 pm 78°	0.185	1.648	1.653	1.650	1.647	1.647	1.649	1.647	1.651	1.649	1.638	b2.54	0
					BACKWATER PROFILE								
77°	3.755	85	100	115	130	145	160	175	190	205	220		
4:05	2.16	3.755	3.713	3.667	3.628	3.586	3.542	3.502	3.462	3.418	3.377	b2.54	1
76°	3.505	175	190	205	220	235	250	265	280	295	310		
4:45	1.903	3.504	3.464	3.419	3.374	3.334	3.291	3.252	3.210	3.170	3.130	b2.54	2
77°	3.250	265	280	295	310	325	340	355	370	385	400		
5:25	1.645	3.251	3.210	3.169	3.131	3.093	3.051	3.011	2.968	2.927	2.883	b2.53	3
77°	3.008	355	370	385	400	415	430	445	460	475	490		
6:00	1.405	3.007	2.967	2.925	2.884	2.847	2.809	2.768	2.727	2.688	2.646	b2.56	4
78°	2.768	445	460	475	490	505	520	535	550	565	580		
6:45	1.165	2.769	2.727	2.686	2.648	2.610	2.573	2.538	2.500	2.462	2.427	b2.58	5
78°	2.532	535	550	565	580	595	610	625	640	655	670		QM
7:30	0.995	2.537	2.503	2.464	2.426	2.393	2.358	2.326	2.292	2.255	2.224	b2.60	6
80°	2.320	625	640	655	670	685	700	715	730	745	760		
9:55	0.765	2.323	2.290	2.258	2.227	2.198	2.167	2.137	2.107	2.082	2.053	b2.60	7
79°	2.185	715	730	745	760	775	790	805	820	835	850		
10:40	0.63	2.137	2.109	2.080	2.052	2.024	1.999	1.972	1.946	1.927	1.905	b2.56	8
79°	1.969	805	820	835	850	865	880	895	910	925	940		
11:20	0.500	1.970	1.949	1.925	1.900	1.880	1.860	1.841	1.822	1.802	1.784	b2.56	9
79°	1.841	895	910	925	940	955	970	985	1000	1015	1030		
11:45	0.375	1.843	1.822	1.803	1.784	1.765	1.747	1.737	1.725	1.737	1.712	b2.56	10
am	1.784	985	1000	1015	1030	1045	1060	1075	1090	1105	1120		
12:05	0.270	1.737	1.728	1.718	1.712	1.700	1.689	1.686	1.681	1.683	1.665	b2.56	11
79°	1.690	1075	1090	1105	1120	1135	1150	1165	1180	1195	1210		
12:25	0.205	1.690	1.682	1.675	1.668	1.661	1.661	1.659	1.658	1.658	1.652	b2.56	12

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [b] *Data for $2CHBr_2$ gage, on 24-inch line. QM indicates a series of discharge measurements.*

TABLE 11

BACKWATER PROFILE, CROSS-SECTION 1

Date: August 3, 1944 Discharge: 40.36 second-feet Normal depth: 1.839 feet

HOUR and TEMP.	GAGE IDENTIFICATION												RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
	1.841	NORMAL DEPTH READINGS--NO BACKWATER											
2:45 pm	0.190	1.836	1.841	1.840	1.842	1.838	1.840	1.838	1.838	1.839	1.840	b3.46	0
	BACKWATER PROFILE												
78°	3.750	89	104	119	134	149	164	179	194	209	224		
3:30	1.99	3.750	3.703	3.661	3.619	3.576	3.536	3.499	3.455	3.413	3.373	b3.42	1
	3.500	179	194	209	224	239	254	269	284	299	314		
4:00	1.73	3.500	3.458	3.412	3.370	3.331	3.290	3.257	3.213	3.172	3.132	b3.44	2
78°	3.256	269	284	299	314	329	344	359	374	389	404		
4:30	1.485	3.258	3.215	3.172	3.130	3.092	3.050	3.012	2.969	2.930	2.891	b3.46	3
79°	3.019	359	374	389	404	419	434	449	464	479	494		
5:30	1.27	3.017	2.972	2.930	2.892	2.854	2.820	2.784	2.743	2.709	2.679	b3.44	4
	2.783	449	464	479	494	509	524	539	554	569	584		
6:05	1.045	2.784	2.746	2.709	2.673	2.639	2.602	2.572	2.535	2.504	2.469	b3.45	5
80°	2.570	539	554	569	584	599	614	629	644	659	674		
7:05	0.90	2.572	2.535	2.505	2.474	2.436	2.408	2.380	2.335	2.308	2.288	b3.44	6
80°	2.377	629	644	659	674	689	704	719	734	749	764		
8:15	0.758	2.380	2.350	2.311	2.282	2.260	2.232	2.210	2.184	2.156	2.128	b3.44	7
	2.212	719	734	749	764	779	794	809	824	839	854		
8:50	0.59	2.215	2.192	2.158	2.130	2.114	2.094	2.080	2.050	2.037	2.011	b3.46	8
81°	2.077	809	824	839	854	869	884	899	914	929	944		
9:20	0.425	2.080	2.063	2.037	2.010	1.993	1.982	1.960	1.944	1.931	1.920	b3.47	9
81°	1.960	899	914	929	944	959	974	989	1004	1019	1034		
10:00	0.288	1.961	1.943	1.933	1.926	1.912	1.902	1.898	1.888	1.877	1.870	b3.48	10
81°	1.898	989	1004	1019	1034	1049	1064	1079	1094	1109	1124		
10:30	0.203	1.900	1.887	1.875	1.867	1.862	1.859	1.852	1.848	1.845	1.845	b3.49	11
81°	1.850	1079	1094	1109	1124	1139	1154	1169	1184	1199	1214		
11:10	0.168	1.850	1.851	1.847	1.846	1.845	1.841	1.841	1.840	1.842	1.842	b3.50	12

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [b] *Data for $2CHBr_2$ gage, 24-inch line.*

TABLE 12

BACKWATER PROFILE, CROSS-SECTION 2

Date: March 19, 1945 Discharge: 3.90 second-feet Normal depth: 0.391 feet

HOUR and TEMP.	GAGE IDENTIFICATION												RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
72°	0.389	NORMAL DEPTH READINGS--NO BACKWATER											
6:05 pm	0.050	0.380	0.396	0.390	0.392	0.385	0.395	0.393	0.395	0.393	0.387	e1.45	0
	BACKWATER PROFILE												
72°	2.330	560	575	590	605	620	635	650	665	680	695		
6:25	2.000	2.326	2.284	2.234	2.194	2.153	2.109	2.056	2.011	1.969	1.919	d0.43	1
73°	2.058	650	665	680	695	710	725	740	755	770	785		
8:00	1.732	2.057	2.014	1.964	1.921	1.878	1.834	1.788	1.744	1.700	1.651	e1.46	2
72°	1.785	740	755	770	785	800	815	830	845	860	875		
8:30	1.458	1.787	1.745	1.696	1.652	1.610	1.566	1.520	1.475	1.433	1.386	d0.44	3
73°	1.518	830	845	860	875	890	905	920	935	950	965		
9:00	1.186	1.520	1.476	1.429	1.386	1.342	1.299	1.253	1.209	1.167	1.118	e1.46	4
72°	1.249	920	935	950	965	980	995	1010	1025	1040	1055		
9:25	0.919	1.253	1.208	1.161	1.117	1.073	1.030	0.985	0.943	0.901	0.855	d0.44	5
73°	0.983	1010	1025	1040	1055	1070	1085	1100	1115	1130	1145		
9:50	0.658	0.986	0.943	0.898	0.855	0.814	0.773	0.730	0.690	0.650	0.610	e1.46	6
73°	0.728	1100	1115	1130	1145	1160	1175	1190	1205	1220	1235		
10:15	0.402	0.730	0.691	0.649	0.611	0.572	0.541	0.506	0.478	0.455	0.432	d0.45	7
73°	0.509	1190	1205	1220	1235	1250	1265	1280	1295	1310	1325		
10:35	0.176	0.505	0.480	0.453	0.434	0.418	0.413	0.405	0.401	0.398	0.393	e1.46	8
73°	0.406	1280	1295	1310	1325	1340	1355	1370	1385	1400	1415		
11:00	0.072	0.406	0.405	0.397	0.396	0.388	0.397	0.395	0.395	0.395	0.390	d0.44	9
	0.385												
11:20	0.050	0.377	0.398	0.390	0.394	0.384	0.398	0.393	0.395	0.394	0.388		0

---

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [d] *Data for $2CHBr_2$ gage, 12-inch line.* [e] *Data for CCl_4 gage, 12-inch line.*

TABLE 13

BACKWATER PROFILE, CROSS-SECTION 2

Date: April 11, 1945 Discharge: 7.99 second-feet Normal depth: 0.612 feet

HOUR and TEMP.	GAGE IDENTIFICATION											Diff.	RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9		
75°	0.660	NORMAL DEPTH READINGS--NO BACKWATER											
4:15 pm	0.098	0.611	0.617	0.613	0.612	0.607	0.612	0.611	0.612	0.611	0.615	d1.80	0
		BACKWATER PROFILE											
75°	3.010	333	348	363	378	393	408	423	438	453	468		
4:50	2.460	2.998	2.957	2.915	2.871	2.829	2.785	2.741	2.695	2.650	2.604	d1.78	1
76°	2.744	423	438	453	468	483	498	513	528	543	558		
5:30	2.194	2.737	2.694	2.650	2.608	2.563	2.521	2.478	2.430	2.386	2.341	d1.80	2
76°	2.485	513	528	543	558	573	588	603	618	633	648		
6:00	1.931	2.473	2.430	2.387	2.345	2.303	2.261	2.216	2.171	2.126	2.081	d1.78	3
76°	2.221	603	618	633	648	663	678	693	708	723	738		
6:30	1.689	2.210	2.169	2.126	2.084	2.040	1.996	1.950	1.904	1.860	1.817	d1.80	4
76°	1.957	693	708	723	738	753	768	783	798	813	828		
6:50	1.429	1.946	1.904	1.862	1.819	1.774	1.730	1.687	1.643	1.601	1.557	d1.80	5
76°	1.698	783	798	813	828	843	858	873	888	903	918		
7:50	1.166	1.687	1.643	1.601	1.558	1.515	1.472	1.428	1.384	1.342	1.301	d1.80	6
76°	1.447	873	888	903	918	933	948	963	978	993	1008		
8:15	0.899	1.425	1.385	1.343	1.300	1.257	1.215	1.173	1.129	1.087	1.050	d1.80	7
76°	1.184	963	978	993	1008	1023	1038	1053	1068	1083	1098		
8:35	0.647	1.169	1.129	1.089	1.048	1.007	0.968	0.931	0.893	0.859	0.826	d1.80	8
76°	0.963	1053	1068	1083	1098	1113	1128	1143	1158	1173	1188		
8:50	0.415	0.926	0.895	0.860	0.826	0.793	0.766	0.736	0.711	0.689	0.672	d1.80	9
77°	0.767	1143	1158	1173	1188	1203	1218	1233	1248	1263	1278		
9:10	0.224	0.731	0.711	0.690	0.672	0.654	0.646	0.636	0.630	0.626	0.624	d1.82	10
77°		1233	1248	1263	1278	1293	1308	1323	1338	1353	1368		
9:40	0.130	0.630	0.629	0.626	0.624	0.616	0.617	0.616	0.615	0.614	0.615	d1.80	11
77°	0.652												
9:55	0.098	0.604	0.617	0.614	0.612	0.606	0.613	0.614	0.612	0.613	0.616		0

[a] *In this column the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [d] *Data for $2CHBr_2$ gage, 12-inch line.*

TABLE 14

BACKWATER PROFILE, CROSS-SECTION 2

Date: April 21, 1945 Discharge: 12.38 second-feet Normal depth: 0.812 feet

HOUR and TEMP.	GAGE IDENTIFICATION												RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
72°	0.874	NORMAL DEPTH READINGS--NO BACKWATER											
4:15 pm	0.120	0.810	0.817	0.814	0.811	0.804	0.817	0.812	0.811	0.809	0.812	d4.46	0
	BACKWATER PROFILE												
72°	3.211	263	278	293	308	323	338	353	368	383	398		
4:40	2.460	3.212	3.173	3.130	3.084	3.044	3.000	2.956	2.913	2.868	2.823	d4.42	1
73°	2.965	353	368	383	398	413	428	443	458	473	488		
5:15	2.200	2.956	2.913	2.867	2.825	2.784	2.742	2.699	2.654	2.611	2.566	d4.43	2
73°	2.705	443	458	473	488	503	518	533	548	563	578		
5:45	1.947	2.697	2.656	2.611	2.568	2.528	2.485	2.442	2.398	2.354	2.310	d4.42	3
73°	2.449	533	548	563	578	593	608	623	638	653	668		
6:15	1.716	2.440	2.397	2.354	2.311	2.271	2.229	2.185	2.141	2.097	2.055	d4.44	4
74°	2.196	623	638	653	668	683	698	713	728	743	758		
6:45	1.483	2.183	2.141	2.098	2.058	2.014	1.970	1.925	1.885	1.842	1.804	d4.44	5
75°	1.937	713	728	743	758	773	788	803	818	833	848		
8:20	1.230	1.924	1.884	1.843	1.802	1.761	1.720	1.677	1.634	1.593	1.552	d4.44	6
75°	1.689	803	818	833	848	863	878	893	908	923	938		
8:40	0.979	1.674	1.635	1.593	1.552	1.511	1.471	1.431	1.391	1.352	1.313		7
75°	1.446	893	908	923	938	953	968	983	998	1013	1028		
9:00	0.736	1.430	1.391	1.352	1.314	1.276	1.241	1.203	1.166	1.132	1.101		8
75°	1.230	983	998	1013	1028	1043	1058	1073	1088	1103	1118		
9:20	0.513	1.202	1.168	1.133	1.100	1.066	1.038	1.006	0.980	0.959	0.941		9
76°	1.050	1073	1088	1103	1118	1133	1148	1163	1178	1193	1208		
9:40	0.328	1.009	0.983	0.959	0.937	0.908	0.896	0.878	0.865	0.857	0.849		10
76°	0.936	1163	1178	1193	1208	1223	1238	1253	1268	1283	1298		
10:15	0.195	0.875	0.869	0.857	0.847	0.837	0.832	0.830	0.825	0.820	0.818	d4.44	11

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [d] *Data for* $2CHBr_2$ *gage, 12-inch line.*

TABLE 15

BACKWATER PROFILE, CROSS-SECTION 2

Date: May 25, 1945 Discharge: 20.13 second-feet Normal depth: 1.121 feet

HOUR and TEMP.	GAGE IDENTIFICATION											Diff.	RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9		
75°	1.203	NORMAL DEPTH READINGS--NO BACKWATER											
3:45 pm	0.175	1.118	1.123	1.118	1.120	1.118	1.126	1.120	1.121	1.114	1.129	b0.81	0
	BACKWATER PROFILE												
76°	3.511	166	181	196	211	226	241	256	271	286	301		
4:25	2.460	3.509	3.468	3.424	3.382	3.340	3.300	3.257	3.216	3.173	3.129	b0.81	1
76°	3.264	256	271	286	301	316	331	346	361	376	391		
4:50	2.202	3.257	3.216	3.172	3.130	3.088	3.046	3.006	2.963	2.920	2.878	b0.83	2
77°	3.112	346	361	376	391	406	421	436	451	466	481		
5:10	1.952	3.006	2.963	2.921	2.879	2.836	2.793	2.753	2.711	2.668	2.625	b0.83	3
77°	2.758	436	451	466	481	496	511	526	541	556	571		
5:35	1.733	2.752	2.709	2.668	2.626	2.584	2.542	2.502	2.460	2.417	2.376	b0.83	4
77°	2.515	526	541	556	571	586	601	616	631	646	661		
6:20	1.516	2.500	2.460	2.418	2.377	2.337	2.295	2.255	2.214	2.173	2.133	b0.83	5
77°	2.270	616	631	646	661	676	691	706	721	736	751		
7:40	1.260	2.255	2.214	2.172	2.133	2.093	2.053	2.014	1.975	1.936	1.896	b0.84	6
77°	2.022	706	721	736	751	766	781	796	811	826	841		
8:20	1.034	2.014	1.975	1.934	1.896	1.858	1.820	1.784	1.747	1.712	1.677	b0.85	7
77°	1.804	796	811	826	841	856	871	886	901	916	931		
9:15	0.825	1.784	1.748	1.712	1.678	1.645	1.612	1.577	1.545	1.514	1.484	b0.83	8
77°	1.617	886	901	916	931	946	961	976	991	1006	1021		
9:45	0.617	1.576	1.545	1.513	1.483	1.453	1.425	1.396	1.367	1.343	1.322	b0.84	9
77°	1.453	976	991	1006	1021	1036	1051	1066	1081	1096	1111		
10:10	0.458	1.396	1.368	1.343	1.322	1.303	1.285	1.268	1.251	1.234	1.219	b0.84	10
78°	1.327	1066	1081	1096	1111	1126	1141	1156	1171	1186	1201		
10:45	0.346	1.267	1.251	1.234	1.219	1.205	1.195	1.187	1.181	1.176	1.172	b0.83	11
78°	1.278	1156	1171	1186	1201	1216	1231	1246	1261	1276	1291		
11:20	0.279	1.187	1.181	1.176	1.173	1.167	1.160	1.149	1.151	1.141		b0.83	12

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [b] *Data for $2CHBr_2$ gage, 24-inch line.*

TABLE 16

BACKWATER PROFILE, CROSS-SECTION 2

Date: April 6, 1945 Discharge: 30.22 second-feet Normal depth: 1.489 feet

HOUR and TEMP.	GAGE IDENTIFICATION												RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
68°	1.55	NORMAL DEPTH READINGS--NO BACKWATER											
4:50 pm	0.344	1.488	1.490	1.491	1.488	1.488	1.488	1.489	1.487	1.490	1.492	bl.82	0
	BACKWATER PROFILE												
71°	3.706	101	116	131	146	161	176	191	206	221	236		
5:50	2.410	3.706	3.665	3.624	3.585	3.546	3.506	3.466	3.424	3.381	3.340	bl.82	1
71°	3.464	191	206	221	236	251	266	281	296	311	326		
6:20	2.157	3.464	3.423	3.381	3.341	3.301	3.262	3.224	3.183	3.141	3.100	bl.82	2
72°	3.228	281	296	311	326	341	356	371	386	401	416		
7:40	1.937	3.223	3.183	3.142	3.101	3.061	3.022	2.982	2.942	2.904	2.864	bl.84	3
73°	2.995	371	386	401	416	431	446	461	476	491	506		
8:15	1.735	2.982	2.943	2.903	2.866	2.827	2.786	2.747	2.710	2.672	2.635	bl.84	4
73°	2.767	461	476	491	506	521	536	551	566	581	596		
8:45	1.494	2.747	2.708	2.671	2.635	2.600	2.563	2.525	2.489	2.454	2.418	bl.86	5
74°	2.534	551	566	581	596	611	626	641	656	671	686		
9:20	1.314	2.524	2.492	2.453	2.417	2.387	2.352	2.318	2.284	2.250	2.216	bl.84	6
74°	2.359	641	656	671	686	701	716	731	746	761	776		
10:00	1.119	2.317	2.283	2.250	2.217	2.181	2.150	2.123	2.097	2.068	2.041	bl.86	7
74°	2.181	731	746	761	776	791	806	821	836	851	866		
10:45	0.957	2.124	2.096	2.070	2.040	2.014	1.984	1.956	1.928	1.904	1.880	bl.84	8
75°	2.015	821	836	851	866	881	896	911	926	941	956		
11:25	0.801	1.955	1.928	1.899	1.874	1.846	1.814	1.790	1.767	1.750	1.721	bl.84	9
75°	1.848	911	926	941	956	971	986	1001	1016	1031	1046		
12:00	0.646	1.789	1.766	1.742	1.722	1.698	1.677	1.660	1.640	1.622	1.610	bl.84	10
75°	1.713	1001	1016	1031	1046	1061	1076	1091	1106	1121	1136		
12:25 am	0.521	1.660	1.640	1.624	1.614	1.601	1.589	1.580	1.572	1.564	1.560	bl.84	11
75°	1.645	1091	1106	1121	1136	1151	1166	1181	1196	1211	1226		
12:45	0.434	1.581	1.573	1.563	1.557	1.548	1.552	1.530	1.526	1.530	1.530	bl.82	12

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [b] *Data for $2CHBr_2$ gage, 24-inch line.*

TABLE 17

BACKWATER PROFILE, CROSS-SECTION 2

Date: April 9, 1945 Discharge: 40.39 second-feet Normal depth: 1.840 feet

HOUR and TEMP.	GAGE IDENTIFICATION BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	RUN NO.
73°	1.94					NORMAL DEPTH READINGS--NO BACKWATER							QM
2:15 pm	0.430	1.842	1.842	1.839	1.834	1.835	1.847	1.852	1.843	1.834	1.831	b3.32	0
						BACKWATER PROFILE							
74°	3.705	109	124	139	154	169	184	199	214	229	244		
4:30	2.123	3.703	3.665	3.625	3.590	3.556	3.517	3.480	3.437	3.393	3.355	b3.32	1
74°	3.484	199	214	229	244	259	274	289	304	319	334		
5:10	1.884	3.472	3.433	3.400	3.360	3.326	3.284	3.249	3.211	3.175	3.140	b3.34	2
74°	3.271	289	304	319	334	349	364	379	394	409	424		QM
5:50	1.711	3.249	3.210	3.175	3.145	3.109	3.073	3.036	3.001	2.965	2.932	b3.32	3
75°	3.066	379	394	409	424	439	454	469	484	499	514		
7:50	1.514	3.036	2.998	2.967	2.931	2.897	2.866	2.833	2.800	2.764	2.731	b3.32	4
75°	2.852	469	484	499	514	529	544	559	574	589	604		
8:30	1.353	2.831	2.798	2.768	2.735	2.708	2.682	2.648	2.611	2.580	2.548	b3.34	5
75°	2.671	559	574	589	604	619	634	649	664	679	694		
9:10	1.142	2.646	2.610	2.580	2.549	2.514	2.493	2.468	2.440	2.412	2.377	b3.32	6
76°	2.509	649	664	679	694	709	724	739	754	769	784		
9:45	0.977	2.466	2.442	2.406	2.378	2.358	2.334	2.307	2.287	2.270	2.248	b3.32	7
76°	2.332	739	754	769	784	799	814	829	844	859	874		
10:10	0.800	2.300	2.283	2.262	2.247	2.220	2.195	2.181	2.164	2.147	2.134	b3.32	8
76°	2.238	829	844	859	874	889	904	919	934	949	964		
10:40	0.689	2.181	2.162	2.144	2.132	2.107	2.087	2.073	2.060	2.046	2.030	b3.34	9
76°	2.145	919	934	949	964	979	994	1009	1024	1039	1054		
11:15	0.615	2.072	2.062	2.042	2.032	2.021	2.014	2.002	1.988	1.980		b3.34	10
76°	2.095	1009	1024	1039	1054	1069	1084	1099	1114	1129	1144		
11:45	0.543	2.001	1.987	1.983	1.968	1.955	1.949	1.939	1.930	1.929	1.914	b3.34	11
77°	2.047	1099	1114	1129	1144	1159	1174	1189	1204	1219	1234		
12:20 am	0.510	1.935	1.932	1.921	1.913	1.909	1.900	1.896	1.889	1.880	1.875	b3.32	12

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [b] *Data for* $2CHBr_2$ *gage, 24-inch line. QM indicates a series of discharge measurements.*

TABLE 18

BACKWATER PROFILE, CROSS-SECTION 3

Date: May 1, 1947 Discharge: 3.77 second-feet Normal depth: 0.404 feet

HOUR and TEMP. 75°	GAGE IDENTIFICATION												RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
	NORMAL DEPTH READINGS--NO BACKWATER												
10:20 am	0.067	0.407	0.408	0.399	0.401	0.398	0.407	0.405	0.408	0.400	0.403	d0.47	0
	BACKWATER PROFILE												
75°	2.793	404	419	434	449	464	479	494	509	524	539		
10:55	2.460	2.790	2.742	2.695	2.654	2.610	2.569	2.524	2.477	2.427	2.384	e1.57	1
75°	2.525	494	509	524	539	554	569	584	599	614	629		
11:20	2.188	2.523	2.474	2.428	2.388	2.343	2.302	2.255	2.210	2.161	2.117	d0.45	2
75°	2.258	584	599	614	629	644	659	674	689	704	719		
11:45	1.914	2.255	2.207	2.160	2.120	2.075	2.034	1.982	1.940	1.889	1.848	e1.57	3
75°	1.982	674	689	704	719	734	749	764	779	794	809		
12:00	1.645	1.983	1.935	1.890	1.847	1.801	1.760	1.712	1.671	1.620	1.580	d0.45	4
75°	1.717	764	779	794	809	824	839	854	869	884	899		
12:25 pm	1.364	1.713	1.667	1.621	1.580	1.534	1.491	1.445	1.404	1.354	1.312	e1.57	5
76°	1.449	854	869	884	899	914	929	944	959	974	989		
12:50	1.089	1.446	1.399	1.353	1.313	1.265	1.224	1.178	1.136	1.086	1.047	d0.47	6
75°	1.184	944	959	974	989	1004	1019	1034	1049	1064	1079		
3:35	0.828	1.180	1.133	1.087	1.046	1.001	0.960	0.914	0.875	0.826	0.789	e1.57	7
75°	0.922	1034	1049	1064	1079	1094	1109	1124	1139	1154	1169		
4:00	0.559	0.917	0.872	0.827	0.787	0.746	0.708	0.664	0.631	0.586	0.556	d0.47	8
75°	0.666	1124	1139	1154	1169	1184	1199	1214	1229	1244	1259		
4:20	0.309	0.667	0.627	0.586	0.556	0.520	0.497	0.468	0.452	0.430	0.423	e1.57	9
76°	0.490	1214	1229	1244	1259	1274	1289	1304	1319	1334	1349		
5:10	0.124	0.472	0.451	0.431	0.422	0.406	0.416	0.408	0.410	0.400	0.406	d0.47	10
75°	0.430												
3:00	0.067	0.406	0.408	0.398	0.403	0.397	0.406	0.406	0.407	0.398	0.405	d0.47	0

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [d] *Data for $2CHBr_2$ gage, 12-inch line.* [e] *Data for CCl_4 gage, 12-inch line.*

TABLE 19

BACKWATER PROFILE, CROSS-SECTION 3

Date: May 8, 1947 Discharge: 7.37 second-feet Normal depth: 0.606 feet

HOUR and TEMP.	GAGE IDENTIFICATION												RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
74°	0.653	NORMAL DEPTH READINGS--NO BACKWATER											
9:00 am	0.090	0.608	0.610	0.606	0.606	0.599	0.606	0.605	0.609	0.601	0.610	d1.74	0
	BACKWATER PROFILE												
73°	3.010	332	347	362	377	392	407	422	437	452	467		
9:10	2.460	3.008	2.958	2.913	2.873	2.833	2.790	2.746	2.697	2.653	2.606	d1.74	1
74°	2.719	422	437	452	467	482	497	512	527	542	557		
9:35	2.196	2.747	2.698	2.652	2.612	2.574	2.530	2.485	2.437	2.393	2.347	d1.72	2
74°	2.488	512	527	542	557	572	587	602	617	632	647		
10:15	1.933	2.484	2.436	2.391	2.351	2.312	2.267	2.223	2.177	2.132	2.084	d1.73	3
74.5°	2.228	602	617	632	647	662	677	692	707	722	737		
11:05	1.691	2.223	2.176	2.131	2.089	2.051	2.004	1.956	1.912	1.869	1.825	d1.73	4
74.5°	1.964	692	707	722	737	752	767	782	797	812	827		
11:35	1.443	1.962	1.913	1.869	1.827	1.786	1.742	1.698	1.656	1.612	1.569	d1.73	5
75°	1.705	782	797	812	827	842	857	872	887	902	917		
12:15 pm	1.165	1.701	1.655	1.611	1.570	1.526	1.482	1.440	1.398	1.355	1.314	d1.73	6
75°	1.451	872	887	902	917	932	947	962	977	992	1007		
12:35	0.886	1.441	1.397	1.354	1.313	1.269	1.229	1.186	1.145	1.102	1.061	d1.74	7
75°	1.198	962	977	992	1007	1022	1037	1052	1067	1082	1097		
1:25	0.629	1.187	1.143	1.101	1.063	1.023	0.984	0.943	0.908	0.872	0.838	d1.74	8
75°	0.965	1052	1067	1082	1097	1112	1127	1142	1157	1172	1187		
1:45	0.392	0.946	0.907	0.870	0.838	0.801	0.774	0.741	0.716	0.695	0.678	d1.74	9
75°	0.774	1142	1157	1172	1187	1202	1217	1232	1247	1262	1277		
2:05	0.204	0.745	0.717	0.693	0.673	0.653	0.646	0.633	0.628	0.618	0.618	d1.71	10
75.5°	0.652												
2:20	0.090	0.608	0.610	0.605	0.607	0.599	0.606	0.605	0.609	0.602	0.609	d1.74	0

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [d] *Data for $2CHBr_2$ gage, 12-inch line.*

TABLE 20

BACKWATER PROFILE, CROSS-SECTION 3

Date: May 15, 1947 Discharge: 10.90 second-feet Normal depth: 0.773 feet

HOUR and TEMP.	GAGE IDENTIFICATION												RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
73°	0.833	NORMAL DEPTH READINGS--NO BACKWATER											
8:20 am	0.113	0.775	0.773	0.772	0.773	0.771	0.773	0.772	0.774	0.771	0.775	d3.80	0
	BACKWATER PROFILE												
73°	3.185	277	292	307	322	337	352	367	382	397	412		
8:35	2.460	3.183	3.134	3.088	3.045	3.003	2.963	2.921	2.876	2.830	2.787	d3.79	1
74°	2.928	367	382	397	412	427	442	457	472	487	502		
9:05	2.200	2.921	2.873	2.830	2.790	2.747	2.705	2.664	2.619	2.573	2.528	d3.79	2
74°	2.678	457	472	487	502	517	532	547	562	577	592		
9:30	1.946	2.665	2.618	2.572	2.531	2.491	2.448	2.405	2.361	2.316	2.272	d3.83	3
74°	2.413	547	562	577	592	607	622	637	652	667	682		
10:10	1.714	2.406	2.360	2.315	2.274	2.235	2.191	2.149	2.104	2.059	2.015	d3.81	4
75°	2.158	637	652	667	682	697	712	727	742	757	772		
11:00	1.419	2.149	2.102	2.059	2.017	1.972	1.930	1.889	1.848	1.804	1.761	d3.81	5
75°	1.901	727	742	757	772	787	802	817	832	847	862		
11:20	1.164	1.890	1.847	1.803	1.761	1.719	1.679	1.639	1.600	1.559	1.518	d3.82	6
76°	1.654	817	832	847	862	877	892	907	922	937	952		
11:45	0.922	1.641	1.600	1.557	1.517	1.478	1.438	1.399	1.360	1.319	1.281	d3.83	7
76°	1.417	907	922	937	952	967	982	997	1012	1027	1042		
12:10 pm	0.684	1.399	1.359	1.320	1.281	1.240	1.203	1.167	1.134	1.098	1.068	d3.83	8
76°	1.198	997	1012	1027	1042	1057	1072	1087	1102	1117	1132		
12:45	0.460	1.173	1.133	1.098	1.063	1.032	0.998	0.969	0.947	0.919	0.897	d3.83	9
76°	1.014	1087	1102	1117	1132	1147	1162	1177	1192	1207	1222		
2:00	0.278	0.967	0.946	0.921	0.897	0.871	0.852	0.837	0.824	0.810	0.810	d3.83	10
77°	0.890	1177	1192	1207	1222	1237	1252	1267	1282	1297	1312		
2:20	0.163	0.842	0.822	0.813	0.803	0.789	0.785	0.784	0.781	0.778	0.781	d3.82	11
77°	0.834												
2:35	0.113	0.775	0.773	0.772	0.773	0.769	0.773	0.772	0.774	0.772	0.774	d3.82	0

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [d] *Data for $2CHBr_2$ gage, 12-inch line.*

TABLE 21

BACKWATER PROFILE, CROSS-SECTION 3

Date: May 16, 1947 Discharge: 18.10 second-feet Normal depth: 1.071 feet

HOUR and TEMP. 76°	GAGE IDENTIFICATION												RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
	1.136				NORMAL DEPTH READINGS--NO BACKWATER								
9:05 am	0.164	1.071	1.070	1.070	1.069	1.060	1.072	1.073	1.060	1.071	1.093	b0.71	0
					BACKWATER PROFILE								
77°	3.468	185	200	215	230	245	260	275	290	305	320		
9:30	2.460	3.464	3.416	3.374	3.333	3.292	3.250	3.209	3.168	3.123	3.079	b0.70	1
77°	3.219	275	290	305	320	335	350	365	380	395	410		
9:45	2.202	3.210	3.166	3.123	3.082	3.041	2.999	2.958	2.916	2.872	2.830	b0.70	2
77°	2.969	365	380	395	410	425	440	455	470	485	500		
10:15	1.958	2.960	2.916	2.872	2.830	2.790	2.750	2.709	2.668	2.626	2.584	b0.71	3
77°	2.725	455	470	485	500	515	530	545	560	575	590		
10:55	1.742	2.711	2.667	2.625	2.585	2.545	2.505	2.465	2.424	2.382	2.342	b0.71	4
77.5°	2.482	545	560	575	590	605	620	635	650	665	680		
11:10	1.447	2.466	2.422	2.382	2.342	2.304	2.266	2.228	2.188	2.147	2.106	b0.71	5
77.5°	2.239	635	650	665	680	695	710	725	740	755	770		
11:40	1.221	2.230	2.186	2.146	2.107	2.069	2.033	1.997	1.959	1.919	1.877	b0.71	6
78°	2.016	725	740	755	770	785	800	815	830	845	860		
12:05 pm	1.002	1.999	1.957	1.918	1.879	1.844	1.805	1.769	1.737	1.702	1.669	b0.71	7
78°	1.802	815	830	845	860	875	890	905	920	935	950		
12:50	0.790	1.773	1.737	1.702	1.668	1.634	1.601	1.568	1.536	1.505	1.475	b0.71	8
78°	1.605	905	920	935	950	965	980	995	1010	1025	1040		
2:50	0.596	1.569	1.536	1.504	1.474	1.444	1.417	1.387	1.357	1.330	1.307	b0.71	9
78°	1.433	995	1010	1025	1040	1055	1070	1085	1100	1115	1130		
3:15	0.430	1.388	1.355	1.328	1.305	1.282	1.260	1.245	1.225	1.207	1.189	b0.71	10
79°	1.300	1085	1100	1115	1130	1145	1160	1175	1190	1205	1220		
6:05	0.303	1.245	1.225	1.205	1.189	1.169	1.156	1.146	1.136	1.121	1.134	b0.71	11
79°	1.218	1160	1175	1190	1205	1220	1235	1250	1265	1280	1295		
6:30	0.227	1.156	1.145	1.133	1.123	1.111	1.105	1.099	1.095	1.100	1.110	b0.71	12

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [b] *Data for $2CHBr_2$ gage, 24-inch line.*

TABLE 22

BACKWATER PROFILE, CROSS-SECTION 3

Date: May 8, 1947 Discharge: 29.80 second-feet Normal depth: 1.512 feet

HOUR and TEMP.	GAGE IDENTIFICATION												RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
	NORMAL DEPTH READINGS--NO BACKWATER												
73°	1.592												
11:10 am	0.285	1.510	1.512	1.510	1.512	1.511	1.512	1.516	1.522	1.509	1.510	b1.83	0
	WATER SURFACE PROFILE												
71°	1.312												
8:00	0.015	1.065	1.287	1.318	1.332	1.341	1.394	1.396	1.400	1.470	1.446	b1.76	-3
73°	1.538												
9:45	0.203	1.406	1.408	1.423	1.441	1.438	1.472	1.457	1.501	1.495	1.491	b1.81	-2
73°	1.574												
10:30	0.260	1.488	1.493	1.496	1.500	1.502	1.503	1.506	1.508	1.502	1.502	b1.83	-1
73°	3.660	125	140	155	170	185	200	215	230	245	260		
11:30	2.300	3.670	3.629	3.588	3.546	3.508	3.466	3.427	3.387	3.348	3.309	b1.82	1
74°	3.426	215	230	245	260	275	290	305	320	335	350		
12:05 pm	2.054	3.428	3.389	3.346	3.308	3.271	3.234	3.195	3.153	3.112	3.073	b1.83	2
74°	3.205	305	320	335	350	365	380	395	410	425	440		
12:40	1.844	3.196	3.154	3.112	3.072	3.033	2.995	2.958	2.921	2.884	2.845	b1.82	3
74°	2.984	395	410	425	440	455	470	485	500	515	530		
2:15	1.647	2.960	2.920	2.881	2.843	2.808	2.772	2.737	2.703	2.671	2.638	b1.80	4
75°	2.758	485	500	515	530	545	560	575	590	605	620		
3:05	1.458	2.738	2.702	2.670	2.638	2.608	2.577	2.544	2.511	2.478	2.445	b1.81	5
75°	2.560	575	590	605	620	635	650	665	680	695	710		
3:35	1.190	2.544	2.510	2.477	2.445	2.415	2.384	2.354	2.323	2.293	2.263	b1.81	6
75°	2.378	665	680	695	710	725	740	755	770	785	800		
4:05	1.034	2.353	2.323	2.294	2.264	2.235	2.206	2.177	2.149	2.121	2.093	b1.81	7
75°	2.202	755	770	785	800	815	830	845	860	875	890		
4:30	0.874	2.178	2.150	2.120	2.092	2.064	2.037	2.009	1.982	1.956	1.930	b1.81	8
76°	2.042	845	860	875	890	905	920	935	950	965	980		
4:55	0.723	2.009	1.983	1.956	1.929	1.903	1.878	1.854	1.831	1.811	1.791	b1.81	9
76°	1.908	935	950	965	980	995	1010	1025	1040	1055	1070		
5:20	0.604	1.855	1.831	1.811	1.791	1.773	1.755	1.737	1.721	1.705	1.691	b1.80	10
76°	1.785	1025	1040	1055	1070	1085	1100	1115	1130	1145	1160		
5:55	0.513	1.735	1.721	1.706	1.692	1.679	1.665	1.651	1.638	1.630	1.614	b1.80	11
76°	1.712	1115	1130	1145	1160	1175	1190	1205	1220	1235	1250		
6:30	0.412	1.649	1.638	1.627	1.617	1.609	1.601	1.596	1.592	1.597	1.588	b1.80	12

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [b] *Data for $2CHBr_2$ gage, 24-inch line.*

TABLE 23

BACKWATER PROFILE, CROSS-SECTION 4

Date: March 27, 1947 Discharge: 3.79 second-feet Normal depth: 0.528 feet

HOUR and TEMP.	GAGE IDENTIFICATION												RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
73°	0.550	NORMAL DEPTH READINGS--NO BACKWATER											
11:50 am	0.183	0.532	0.529	0.527	0.527	0.521	0.530	0.528	0.530	0.527	0.528	el.55	0
	BACKWATER PROFILE												
73.5°	2.790	405	420	435	450	465	480	495	510	525	540		
12:35 pm	2.460	2.789	2.742	2.697	2.655	2.611	2.567	2.524	2.476	2.432	2.386	d0.45	1
73.5°	2.526	495	510	525	540	555	570	585	600	615	630		
1:00	2.190	2.523	2.476	2.432	2.389	2.346	2.303	2.257	2.210	2.165	2.119	el.50	2
74°	2.259	585	600	615	630	645	660	675	690	705	720		
1:50	1.917	2.256	2.209	2.165	2.122	2.080	2.037	1.986	1.943	1.898	1.853	el.50	3
74°	1.987	675	690	705	720	735	750	765	780	795	810		
2:20	1.659	1.987	1.941	1.898	1.853	1.808	1.765	1.720	1.677	1.632	1.589	el.52	4
73.5°	1.722	765	780	795	810	825	840	855	870	885	900		
2:42	1.387	1.721	1.676	1.632	1.588	1.543	1.500	1.455	1.412	1.370	1.326	el.53	5
73.5°	1.458	855	870	885	900	915	930	945	960	975	990		
3:00	1.120	1.456	1.412	1.370	1.326	1.280	1.238	1.194	1.152	1.111	1.070	el.53	6
74°	1.198	945	960	975	990	1005	1020	1035	1050	1065	1080		
3:27	0.852	1.196	1.151	1.110	1.069	1.024	0.985	0.944	0.905	0.866	0.828	el.53	7
74.5°	0.950	1035	1050	1065	1080	1095	1110	1125	1140	1155	1170		
3:55	0.602	0.945	0.905	0.866	0.829	0.790	0.757	0.723	0.694	0.664	0.637	el.53	8
74.5°	0.728	1125	1140	1155	1170	1185	1200	1215	1230	1245	1260		
4:25	0.382	0.725	0.692	0.664	0.638	0.611	0.597	0.581	0.568	0.553	0.547	el.54	9
74.5°	0.595	1215	1230	1245	1260	1275	1290	1305	1320	1335	1350		
4:50	0.242	0.584	0.565	0.554	0.547	0.536	0.538	0.536	0.535	0.531	0.530	el.53	10
74.5°	0.548	1305	1320	1335	1350	1365	1380	1395	1410	1425	1440		
5:00	0.183	0.531	0.528	0.527	0.527	0.521	0.530	0.530	0.530	0.528	0.528	el.53	11

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [d] *Data for $2CHBr_2$ gage, 12-inch line.* [e] *Data for CCl_4 gage, 12-inch line.*

TABLE 24

BACKWATER PROFILE, CROSS-SECTION 4

Date: March 20, 1947 Discharge: 7.62 second-feet Normal depth: 0.780 feet

HOUR and TEMP.	GAGE IDENTIFICATION												RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
	0.813	NORMAL DEPTH READINGS--NO BACKWATER											
72° 11:15 am	0.232	0.780	0.778	0.779	0.779	0.774	0.785	0.783	0.780	0.777	0.783	d1.80	0
	BACKWATER PROFILE												
72°	3.021	332	347	362	377	392	407	422	437	452	467		
11:45	2.460	3.018	2.970	2.926	2.883	2.841	2.799	2.756	2.708	2.666	2.620	d1.80	1
72.5°	2.758	422	437	452	467	482	497	512	527	542	557		
12:30 pm	2.196	2.755	2.708	2.665	2.622	2.578	2.537	2.494	2.446	2.403	2.360	d1.80	2
72.5°	2.497	512	527	542	557	572	587	602	617	632	647		
1:10	1.933	2.494	2.446	2.403	2.360	2.319	2.276	2.234	2.187	2.144	2.100	d1.80	3
73°	2.239	602	617	632	647	662	677	692	707	722	737		
2:15	1.692	2.233	2.187	2.144	2.100	2.060	2.018	1.968	1.924	1.884	1.842	d1.80	4
73.5°	1.975	692	707	722	737	752	767	782	797	812	827		
2:50	1.439	1.969	1.924	1.884	1.840	1.797	1.754	1.712	1.669	1.630	1.589	d1.80	5
73.5°	1.717	782	797	812	827	842	857	872	887	902	917		
3:15	1.183	1.712	1.670	1.630	1.588	1.545	1.504	1.464	1.423	1.383	1.346	d1.80	6
73.5°	1.471	872	887	902	917	932	947	962	977	992	1007		
3:45	0.930	1.464	1.424	1.385	1.343	1.304	1.267	1.230	1.192	1.158	1.126	d1.80	7
74°	1.240	962	977	992	1007	1022	1037	1052	1067	1082	1097		
4:00	0.700	1.230	1.193	1.158	1.124	1.088	1.057	1.028	0.997	0.970	0.950	d1.80	8
74°	1.045	1052	1067	1082	1097	1112	1127	1142	1157	1172	1187		
4:30	0.498	1.028	0.997	0.971	0.948	0.921	0.905	0.883	0.864	0.850	0.840	d1.80	9
74°	0.904	1142	1157	1172	1187	1202	1217	1232	1247	1262	1277		
5:05	0.350	0.883	0.864	0.850	0.838	0.820	0.820	0.811	0.800	0.796	0.796	d1.80	10
74.5°	0.834	1232	1247	1262	1277	1292	1307	1322	1337	1352	1367		
5:35	0.286	0.810	0.802	0.796	0.794	0.786	0.790	0.788	0.785	0.781	0.783	d1.80	11
74.5°	0.816	1322	1337	1352	1367	1382	1397	1412	1427	1442	1457		
6:00	0.264	0.786	0.784	0.782	0.784	0.775	0.785	0.782	0.778	0.775	0.781	d1.80	12

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [d] *Data for $2CHBr_2$ gage, 12-inch line.*

TABLE 25

BACKWATER PROFILE, CROSS-SECTION 4

Date: March 22, 1947 Discharge: 12.19 second-feet Normal depth: 1.028 feet

HOUR and TEMP.	GAGE IDENTIFICATION												RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
73.5°	1.079	NORMAL DEPTH READINGS--NO BACKWATER											
10:00 am	0.303	1.033	1.028	1.031	1.029	1.024	1.029	1.028	1.028	1.026	1.030	d4.44	0
	BACKWATER PROFILE												
74°	3.222	265	280	295	310	325	340	355	370	385	400		
10:40	2.460	3.222	3.176	3.132	3.089	3.050	3.004	2.966	2.920	2.880	2.834	d4.42	1
74.5°	2.968	355	370	385	400	415	430	445	460	475	490		
11:08	2.203	2.968	2.918	2.878	2.837	2.795	2.754	2.713	2.672	2.630	2.585	d4.44	2
75°	2.718	445	460	475	490	505	520	535	550	565	580		
11:44	1.956	2.717	2.668	2.628	2.587	2.545	2.504	2.463	2.417	2.377	2.335	d4.43	3
75°	2.469	535	550	565	580	595	610	625	640	655	670		
12:25 pm	1.731	2.463	2.419	2.377	2.337	2.297	2.258	2.218	2.172	2.130	2.090	d4.44	4
75.5°	2.222	625	640	655	670	685	700	715	730	745	760		
1:20	1.509	2.216	2.172	2.130	2.093	2.054	2.013	1.968	1.928	1.891	1.855	d4.44	5
75.5°	1.977	715	730	745	760	775	790	805	820	835	850		
1:47	1.267	1.971	1.930	1.890	1.852	1.813	1.775	1.735	1.699	1.661	1.631	d4.43	6
76°	1.749	805	820	835	850	865	880	895	910	925	940		
2:25	1.033	1.737	1.699	1.661	1.628	1.591	1.555	1.520	1.488	1.456	1.426	d4.45	7
76°	1.543	895	910	925	940	955	970	985	1000	1015	1030		
2:50	0.821	1.523	1.488	1.456	1.426	1.391	1.364	1.335	1.308	1.283	1.260	d4.44	8
76.5°	1.363	985	1000	1015	1030	1045	1060	1075	1090	1105	1120		
3:30	0.632	1.336	1.308	1.283	1.259	1.234	1.214	1.192	1.175	1.157	1.144	d4.44	9
76.5°	1.223	1075	1090	1105	1120	1135	1150	1165	1180	1195	1210		
4:05	0.497	1.194	1.175	1.157	1.142	1.121	1.112	1.100	1.092	1.080	1.079	d4.46	10
77°	1.134	1165	1180	1195	1210	1225	1240	1255	1270	1285	1300		
4:25	0.414	1.102	1.091	1.080	1.074	1.063	1.060	1.053	1.052	1.045	1.048	d4.44	11
77°	1.099	1255	1270	1285	1300	1315	1330	1345	1360	1375	1390		
5:00	0.375	1.057	1.049	1.045	1.045	1.037	1.041	1.034	1.035	1.030	1.033	d4.44	12
77°	1.019												
5:10	0.303	1.031	1.025	1.028	1.029	1.027	1.029	1.027	1.027	1.025	1.031	d4.46	0

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [d] *Data for $2CHBr_2$ gage, 12-inch line.*

TABLE 26

BACKWATER PROFILE, CROSS-SECTION 4

Date: April 15, 1947 Discharge: 19.10 second-feet Normal depth: 1.369 feet

HOUR and TEMP.	GAGE IDENTIFICATION											Diff.	RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9		
73°	1.426	NORMAL DEPTH READINGS--NO BACKWATER											
11:45 am	0.405	1.370	1.371	1.370	1.368	1.364	1.370	1.370	1.368	1.370	1.371	b0.75	0
	BACKWATER PROFILE												
76°	3.476	185	200	215	230	245	260	275	290	305	320		
6:40 pm	2.455	3.475	3.430	3.388	3.345	3.302	3.262	3.225	3.184	3.143	3.101	b0.74	12
76°	3.269	260	275	290	305	320	335	350	365	380	395		
6:10	2.238	3.270	3.224	3.185	3.143	3.101	3.062	3.020	2.981	2.940	2.902	b0.75	11
76°	3.023	350	365	380	395	410	425	440	455	470	485		
5:35	1.987	3.022	2.979	2.941	2.900	2.857	2.818	2.779	2.739	2.699	2.660	b0.75	10
75°	2.786	440	455	470	485	500	515	530	545	560	575		
5:00	1.745	2.778	2.737	2.699	2.663	2.626	2.588	2.547	2.507	2.470	2.428	b0.74	9
75°	2.554	530	545	560	575	590	605	620	635	650	665		
4:35	1.508	2.545	2.504	2.467	2.428	2.390	2.355	2.318	2.280	2.242	2.210	b0.74	8
75°	2.332	620	635	650	665	680	695	710	725	740	755		
4:05	1.292	2.318	2.278	2.244	2.210	2.175	2.142	2.108	2.070	2.032	2.000	b0.75	7
75°	2.118	710	725	740	755	770	785	800	815	830	845		
3:25	1.090	2.106	2.068	2.036	2.002	1.967	1.936	1.904	1.874	1.845	1.816	b0.75	6
73°	1.925	800	815	830	845	860	875	890	905	920	935		
12:05	0.900	1.904	1.872	1.846	1.816	1.785	1.762	1.731	1.706	1.678	1.660	b0.74	1
74°	1.758	890	905	920	935	950	965	980	995	1010	1025		
12:40	0.740	1.731	1.705	1.680	1.659	1.634	1.616	1.593	1.577	1.555	1.542	b0.75	2
74°	1.630	980	995	1010	1025	1040	1055	1070	1085	1100	1115		
1:40	0.613	1.596	1.572	1.557	1.541	1.525	1.513	1.498	1.485	1.470	1.462	b0.75	3
74°	1.543	1070	1085	1100	1115	1130	1145	1160	1175	1190	1205		
2:10	0.522	1.500	1.482	1.472	1.461	1.450	1.442	1.435	1.428	1.418	1.411	b0.75	4
75°	1.483	1160	1175	1190	1205	1220	1235	1250	1265	1280	1295		
2:50	0.465	1.434	1.427	1.416	1.411	1.400	1.400	1.404	1.396	1.387	1.387	b0.75	5

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [b] *Data for $2CHBr_2$ gage, 24-inch line.*

TABLE 27

BACKWATER PROFILE, CROSS-SECTION 4

Date: April 1, 1947 Discharge: 20.15 second-feet Normal depth: 1.419 feet

HOUR and TEMP.	GAGE IDENTIFICATION												RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
72°	1.480	NORMAL DEPTH READINGS--NO BACKWATER											
11:25 am	0.430	1.421	1.422	1.418	1.420	1.415	1.420	1.416	1.420	1.414	1.428	b0.82	0
	BACKWATER PROFILE												
72°	3.516	175	190	205	220	235	250	265	280	295	310		
11:50	2.460	3.512	3.470	3.426	3.385	3.344	3.302	3.264	3.225	3.180	3.133	b0.80	1
72°	3.269	265	280	295	310	325	340	355	370	385	400		
12:20 pm	2.207	3.264	3.222	3.182	3.140	3.100	3.060	3.020	2.979	2.939	2.897	b0.80	2
72°	3.027	355	370	385	400	415	430	445	460	475	490		QM
12:55	1.969	3.020	2.978	2.939	2.900	2.859	2.819	2.779	2.740	2.700	2.662	b0.82	3
73.5°	2.867	415	430	445	460	475	490	505	520	535	550		QM
3:20	1.802	2.859	2.819	2.779	2.742	2.701	2.664	2.627	2.588	2.548	2.511	b0.80	4
75°	2.637	505	520	535	550	565	580	595	610	625	640		
5:25	1.584	2.627	2.589	2.547	2.514	2.479	2.440	2.402	2.366	2.330	2.294	b0.81	5
75°	2.416	595	610	625	640	655	670	685	700	715	730		
6:05	1.406	2.403	2.366	2.330	2.295	2.260	2.223	2.188	2.152	2.119	2.085	b0.82	6
75°	2.207	685	700	715	730	745	760	775	790	805	820		
6:40	1.213	2.187	2.152	2.118	2.088	2.055	2.021	1.986	1.956	1.924	1.898	b0.82	7
75°	2.009	775	790	805	820	835	850	865	880	895	910		
7:07	1.012	1.986	1.956	1.924	1.897	1.868	1.840	1.811	1.787	1.760	1.740	b0.82	8
75.5°	1.847	865	880	895	910	925	940	955	970	985	1000		
7:40	0.855	1.814	1.786	1.760	1.738	1.715	1.692	1.669	1.653	1.630	1.613	b0.82	9
76°	1.711	955	970	985	1000	1015	1030	1045	1060	1075	1090		
8:20	0.714	1.670	1.648	1.630	1.613	1.591	1.576	1.564	1.554	1.538	1.522	b0.82	10
76°	1.605	1045	1060	1075	1090	1105	1120	1135	1150	1165	1180		
8:50	0.623	1.565	1.551	1.536	1.525	1.515	1.502	1.495	1.496	1.475	1.472	b0.82	11
76°	1.481												
9:10	0.430	1.420	1.421	1.417	1.420	1.415	1.421	1.418	1.420	1.412	1.429	b0.82	0

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [b] *Data for $2CHBr_2$ gage, 24-inch line. QM indicates a series of discharge measurements.*

TABLE 28

BACKWATER PROFILE, CROSS-SECTION 4

Date: April 3, 1947 Discharge: 29.91 second-feet Normal depth: 1.877 feet

HOUR and TEMP.	GAGE IDENTIFICATION											Diff.	RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9		
74°	1.953	NORMAL DEPTH READINGS--NO BACKWATER											
11:10 am	0.615	1.876	1.879	1.875	1.877	1.876	1.877	1.881	1.875	1.880	1.876	b1.86	0
	BACKWATER PROFILE												
74.5°	3.545	178	193	208	223	238	253	268	283	298	313		
11:35	2.157	3.540	3.496	3.460	3.426	3.387	3.350	3.317	3.279	3.242	3.207	b1.85	1
75°	3.325	268	283	298	313	328	343	358	373	388	403		
12:20 pm	1.941	3.317	3.277	3.241	3.205	3.173	3.141	3.110	3.078	3.042	3.006	b1.86	2
75°	3.119	358	373	388	403	418	433	448	463	478	493		
1:20	1.740	3.112	3.077	3.041	3.007	2.975	2.940	2.905	2.871	2.838	2.804	b1.86	3
76°	2.913	448	463	478	493	508	523	538	553	568	583		
1:55	1.557	2.904	2.870	2.839	2.806	2.774	2.743	2.715	2.687	2.657	2.624	b1.86	4
76°	2.752	538	553	568	583	598	613	628	643	658	673		
2:45	1.421	2.716	2.687	2.655	2.624	2.594	2.563	2.535	2.505	2.478	2.450	b1.86	5
76°	2.556	628	643	658	673	688	703	718	733	748	763		
3:15	1.230	2.535	2.505	2.478	2.450	2.425	2.401	2.380	2.358	2.337	2.315	b1.86	6
76°	2.418	718	733	748	763	778	793	808	823	838	853		
3:55	1.118	2.380	2.358	2.336	2.315	2.292	2.272	2.253	2.234	2.216	2.195	b1.86	7
76.5°	2.287	808	823	838	853	868	883	898	913	928	943		
4:25	0.963	2.252	2.233	2.218	2.199	2.179	2.161	2.144	2.128	2.112	2.098	b1.86	8
77°	2.176	898	913	928	943	958	973	988	1003	1018	1033		
5:10	0.894	2.144	2.127	2.112	2.097	2.081	2.067	2.053	2.039	2.029	2.020	b1.86	9
77.5°	2.096	988	1003	1018	1033	1048	1063	1078	1093	1108	1123		
5:35	0.793	2.052	2.039	2.029	2.017	2.008	2.001	1.989	1.985	1.981	1.977	b1.86	10
77.5°	2.028	1078	1093	1108	1123	1138	1153	1168	1183	1198	1213		
6:35	0.765	1.993	1.983	1.981	1.976	1.970	1.962	1.957	1.951	1.930	1.945	b1.86	11

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [b] *Data for $2CHBr_2$ gage, 24-inch line.*

TABLE 29

BACKWATER PROFILE, CROSS-SECTION 4

Date: April 17, 1947 Discharge: 89.98 second-feet Normal depth: 2.335 feet

HOUR and TEMP.	GAGE IDENTIFICATION												RUN NO.
	BW[a]	0	1	2	3	4	5	6	7	8	9	Diff.	
75°	2.380	NORMAL DEPTH READINGS--NO BACKWATER											
12:05 pm	0.805	2.340	2.334	2.331	2.334	2.335	2.335	2.332	2.333	2.337	2.342	b3.34	0
	BACKWATER PROFILE												
75°	3.647	171	186	201	216	231	246	261	276	291	306		
12:25	2.000	3.646	3.613	3.578	3.546	3.510	3.475	3.443	3.407	3.376	3.342	b3.28	1
75.5°	3.447	261	276	291	306	321	336	351	366	381	396		
1:30	1.787	3.443	3.406	3.377	3.342	3.307	3.273	3.243	3.211	3.177	3.146	b3.28	2
76°	3.262	351	366	381	396	411	426	441	456	471	486		
2:15	1.615	3.243	3.211	3.178	3.146	3.116	3.084	3.054	3.024	2.995	2.966	b3.28	3
76°	3.078	441	456	471	486	501	516	531	546	561	576		
2:50	1.453	3.054	3.024	2.995	2.965	2.938	2.912	2.887	2.863	2.837	2.813	b3.29	4
76°	2.911	531	546	561	576	591	606	621	636	651	666		
3:30	1.285	2.885	2.859	2.839	2.816	2.793	2.773	2.752	2.732	2.712	2.693	b3.28	5
75.5°	2.786	621	636	651	666	681	696	711	726	741	756		
4:00	1.157	2.753	2.731	2.712	2.694	2.677	2.661	2.643	2.628	2.612	2.595	b3.28	6
75.5°	2.684	711	726	741	756	771	786	801	816	831	846		
4:40	1.065	2.644	2.627	2.612	2.595	2.581	2.565	2.552	2.537	2.520	2.503	b3.29	7
76.5°	2.610	801	816	831	846	861	876	891	906	921	936		
5:30	1.005	2.552	2.538	2.519	2.505	2.492	2.480	2.471	2.462	2.450	2.440	b3.30	8
76.5°	2.519	891	906	921	936	951	966	981	996	1011	1026		
6:00	0.941	2.471	2.461	2.450	2.442	2.435	2.428	2.417	2.406	2.397	2.389	b3.29	9
76.5°	2.457	981	996	1011	1026	1041	1056	1071	1086	1101	1116		
6:45	0.883	2.415	2.406	2.399	2.388	2.384	2.381	2.379	2.374	2.368	2.362	b3.30	10
76°	2.379												
7:15	0.805	2.339	2.334	2.332	2.331	2.335	2.334	2.330	2.334	2.335	2.338	b3.32	0

[a] *In this column, the first entry is water surface reading of backwater gage; the second is setting of backwater gate.* [b] *Data for $2CHBr_2$ gage, 24-inch line.*

TABLE 30 -- PART I

BACKWATER PROFILE, CROSS-SECTION 5

Date: July 22, August 27, 1947 Discharge: 0.79 second-feet Normal depth: 0.456 feet

DATE and HOUR	TEMP. Air	Water	BW[a]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	CCl_4 and Gas.	CCl_4	RUN NO.
				GAGE IDENTIFICATION																
Aug. 27	81°		0.446	NORMAL DEPTH READINGS--NO BACKWATER																
11:10 am	80°		0.349	0.447	0.457	0.458	0.444	0.457	0.450	0.461	0.462	0.469	0.468	0.462	0.453	0.447	0.446	0.190	0.075	0
				BACKWATER PROFILE																
July 22			2.505	503	513	523	533	543		563		583		603	613	623	633			
1:30 pm	75°		2.460	2.490	2.458	2.427	2.398	2.377		2.314		2.252		2.187	2.160	2.132	2.100		0.080	1
	75°		2.205	603	613	623	633	643		663		683		703	713	723	733			
, 2:15	75°		2.142	2.190	2.160	2.128	2.100	2.077		2.015		1.949		1.885	1.858	1.830	1.798		0.080	2
	76°		1.901	703	713	723	733	743		763		783		803	813	823	833			
2:40	75°		1.825	1.887	1.858	1.828	1.797	1.770		1.708		1.649		1.587	1.558	1.530	1.500		0.080	3
Aug. 27	81°		1.603	803	813	823	833	843	853	863	873	883	893	903	913	923	933			
11:40 am	81°		1.515	1.589	1.558	1.529	1.500	1.470	1.441	1.411	1.381	1.352	1.323	1.294	1.265	1.236	1.208	0.220	0.085	4
pm	81°		1.453	853	863	873	883	893	903	913	923	933	943	953	963	973	983			
12:20	81°		1.373	1.441	1.411	1.382	1.352	1.323	1.294	1.265	1.236	1.207	1.180	1.152	1.125	1.098	1.073	0.220	0.085	5
	82°		1.308	903	913	923	933	943	953	963	973	983	993	1003	1013	1023	1033			
12:50	81°		1.216	1.293	1.265	1.236	1.208	1.179	1.151	1.124	1.097	1.072	1.047	1.021	0.997	0.969	0.944	0.215	0.085	6
	82°		1.166	953	963	973	983	993	1003	1013	1023	1033	1043	1053	1063	1073	1083			
1:20	81°		1.079	1.152	1.124	1.096	1.070	1.043	1.017	0.990	0.966	0.940	0.916	0.890	0.867	0.840	0.816	0.175	0.075	7

TABLE 30 -- (CONCLUDED)

BACKWATER PROFILE, CROSS-SECTION 5

Date: July 22, August 27, 1947 Discharge: 0.79 second-feet Normal depth: 0.456 feet

DATE and HOUR	TEMP. Air / Water	BW[a]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	CCl_4 and Gas.	CCl_4	RUN NO.
		GAGE IDENTIFICATION																	
		NORMAL DEPTH READINGS--NO BACKWATER																	
		BACKWATER PROFILE -- (CONCLUDED)																	
Aug. 27	82°	1.030	1003	1013	1023	1033	1043	1053	1063	1073	1083	1093	1103	1113	1123	1133			
1:55 pm	82°	0.938	1.017	0.991	0.965	0.940	0.913	0.887	0.865	0.841	0.816	0.794	0.772	0.749	0.724	0.701	0.175	0.075	8
	83°	0.902	1053	1063	1073	1083	1093	1103	1113	1123	1133	1143	1153	1163	1173	1183			
2:20	82°	0.804	0.889	0.864	0.841	0.815	0.792	0.769	0.747	0.727	0.707	0.687	0.667	0.646	0.627	0.607	0.175	0.070	9
	83°	0.782	1103	1113	1123	1133	1143	1153	1163	1173	1183	1193	1203	1213	1223	1233			
3:00	82°	0.683	0.770	0.748	0.727	0.704	0.683	0.662	0.646	0.628	0.614	0.598	0.583	0.564	0.548	0.536	0.175	0.070	10
	83°	0.675	1153	1163	1173	1183	1193	1203	1213	1223	1233	1243	1253	1263	1273	1283			
	82°	0.572	0.664	0.646	0.629	0.607	0.594	0.576	0.565	0.554	0.546	0.535	0.523	0.508	0.496	0.489	0.170	0.070	11
	83°	0.585	1203	1213	1223	1233	1243	1253	1263	1273	1283	1293	1303	1313	1323	1333			
4:10		0.480	0.576	0.565	0.553	0.534	0.527	0.515	0.512	0.505	0.504	0.498	0.488	0.477	0.467	0.466	0.180	0.075	12
		0.523	1253	1263	1273	1283	1293	1303	1313	1323	1333	1343	1353	1363	1373	1383			
4:45		0.417	0.516	0.512	0.505	0.489	0.491	0.480	0.483	0.481	0.483	0.480	0.474	0.463	0.457	0.456			13
	83°	0.448																	
5:10		0.349	0.447	0.458	0.448	0.444	0.457	0.449	0.460	0.462	0.468	0.468	0.462	0.452	0.447	0.446	0.175	0.070	0

[a] *In this column, the first entry is water surface reading of the backwater gage; the second is the setting of the backwater gate.*

TABLE 31

BACKWATER PROFILE, CROSS-SECTION 5

Date: August 11, 25, 1947 Discharge: 1.32 second-feet Normal depth: 0.687 feet

DATE and HOUR Aug. 25	TEMP. Air	TEMP. Water	GAGE IDENTIFICATION BW[a]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	CCl_4 and Gas.	$2CHBr_2$	RUN NO.
			NORMAL DEPTH READINGS--NO BACKWATER																	
1:15 pm			0.538	0.685	0.690	0.691	0.680	0.686	0.684	0.687	0.688	0.691	0.694	0.696	0.686	0.680	0.679	0.51		0
			BACKWATER PROFILE																	
Aug. 11			2.577	479	489	499	509	519		539		559		579	589	599	609			
1:10 pm			2.460	2.563	2.530	2.499	2.484	2.448		2.386		2.324		2.262	2.236	2.205	2.174		0.065	1
		84°	2.281	579	589	599	609	619		639		659		679	689	699	709			
1:40		81°	2.154	2.267	2.245	2.201	2.187	2.151		2.089		2.028		1.963	1.937	1.907	1.878		0.060	2
			1.982	679	689	699	709	719		739		759		779	789	799	809			
2:10			1.844	1.966	1.935	1.904	1.887	1.848		1.785		1.728		1.667	1.640	1.611	1.582		0.060	3
Aug. 25			1.686	779	789	799	809	819	829	839	849	859	869	879	889	899	909			
2:35 pm			1.539	1.669	1.641	1.610	1.582	1.551	1.522	1.493	1.465	1.435	1.407	1.380	1.351	1.321	1.296	0.57		4
		87°	1.539	829	839	849	859	869	879	889	899	909	919	929	939	949	959			
2:55		83°	1.392	1.522	1.494	1.465	1.436	1.405	1.377	1.349	1.321	1.294	1.267	1.243	1.215	1.190	1.165	0.57		5
		87°	1.394	879	889	899	909	919	929	939	949	959	969	979	989	999	1009			
3:25			1.240	1.377	1.351	1.321	1.294	1.266	1.239	1.213	1.190	1.164	1.142	1.122	1.099	1.078	1.064			6
		87°	1.258	929	939	949	959	969	979	989	999	1009	1019	1029	1039	1049	1059			
3:50		83°	1.098	1.239	1.214	1.189	1.164	1.141	1.118	1.097	1.079	1.059	1.041	1.024	1.004	0.986	0.972	0.57		7
		85°	1.138	979	985	999	1009	1019	1029	1039	1049	1059	1069	1079	1089	1099	1109			
4:15		83°	0.974	1.119	1.098	1.079	1.055	1.038	1.018	1.003	0.989	0.974	0.958	0.944	0.924	0.910	0.896	0.57		8
		82°	1.020	1029	1039	1049	1059	1069	1079	1089	1099	1109	1119	1129	1139	1149	1159			
4:45		83°	0.872	1.019	1.003	0.988	0.967	0.951	0.935	0.923	0.902	0.899	0.888	0.877	0.860	0.844	0.835	0.57		9
		82°	0.952	1079	1089	1099	1109	1119	1129	1139		1159	1169	1179	1189	1199	1209			
5:20			0.799	0.938	0.924	0.908	0.887	0.874	0.859	0.850		0.828	0.819	0.810	0.794	0.780	0.776	0.51		10
		82°	0.870	1129	1139	1149	1159	1169	1179	1189		1209	1219	1229	1239	1249	1249			
5:50		83°	0.720	0.860	0.849	0.838	0.817	0.809	0.796	0.790		0.776	0.769	0.765	0.748	0.738	0.733	0.48		11

[a] *In this column, the first entry is water surface reading of the backwater gage; the second is the setting of the backwater gate.*

TABLE 32

BACKWATER PROFILE, CROSS-SECTION 5

Date: August 4, September 15, 1947 Discharge: 1.84 second-feet Normal depth: 0.905 feet

DATE and HOUR	TEMP. Air	Water	GAGE IDENTIFICATION BW[a]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	CCl_4	$2CHBr_2$	RUN NO.
Sept. 15			NORMAL DEPTH READINGS--NO BACKWATER																	
10:30 am	74°	79°	0.730	0.904	0.909	0.907	0.900	0.906	0.900	0.907	0.907	0.909	0.908	0.909	0.904	0.901	0.904	0.375		0
			BACKWATER PROFILE																	
Aug. 4			2.620	465	475	485	495	505		525		545		565	575	585	595			
12:15 pm			2.460	2.604	2.571	2.539	2.513	2.485		2.428		2.365		2.303	2.275	2.247	2.215	0.365	0.11	1
	84°		2.322	565	575	585	595	605		625		645		665	675	685	695			
12:45	82°		2.156	2.305	2.274	2.243	2.217	2.188		2.131		2.068		2.006	1.976	1.948	1.918	0.37	0.10	2
			2.022	665	675	685	695	705		725		745		765	775	785	795			
1:10			1.849	2.007	1.977	1.947	1.918	1.887		1.829		1.770		1.710	1.683	1.653	1.624	0.37	0.11	3
Sept. 15			1.727	765	775	785	795	805	815	825	835	845	855	865	875	885	895			
11:30 am			1.546	1.710	1.684	1.653	1.626	1.598	1.566	1.537	1.508	1.480	1.453	1.425	1.397	1.369	1.343	0.385		4
pm	74°		1.580	815	825	835	845	855	865	875	885	895	905	915	925	935	945			
12:40	79°		1.397	1.566	1.538	1.508	1.481	1.454	1.423	1.395	1.369	1.341	1.316	1.292	1.265	1.242	1.221	0.395		5
			1.439	865	875	885	895	905	915	925	935	945	955	965	975	985	995			
1:20			1.248	1.423	1.396	1.368	1.341	1.318	1.288	1.263	1.239	1.217	1.197	1.177	1.155	1.135	1.125	0.380		6
	75°		1.305	915	925	935	945	955	965	975	985	995	1005	1015	1025	1035	1045			
2:00	79°		1.110	1.288	1.266	1.241	1.218	1.199	1.174	1.155	1.139	1.124	1.110	1.097	1.079	1.068	1.067	0.395		7
			1.188	965	975	985	995	1005	1015	1025	1035	1045	1055	1065	1075	1085	1095			
2:35			0.994	1.174	1.157	1.140	1.121	1.109	1.090	1.081	1.068	1.060	1.049	1.038	1.026	1.017	1.016	0.395		8
	75°		1.106	1015	1025	1035	1045	1055	1065	1075	1085	1095	1105	1115	1125	1135	1145			
3:15	79°		0.907	1.093	1.081	1.069	1.052	1.046	1.032	1.027	1.018	1.012	1.006	0.997	0.987	0.979	0.977	0.390		9
			1.044	1065	1075	1085	1095	1105	1115	1125	1135	1145	1155	1165	1175	1185	1195			
3:40			0.849	1.034	1.029	1.019	1.005	1.003	0.988	0.987	0.983	0.979	0.974	0.968	0.959	0.952	0.952	0.380		10
			1.001	1115	1125	1135	1145	1155	1165	1175	1185	1195	1205	1215	1225	1235	1245			
4:10			0.805	0.990	0.987	0.982	0.969	0.968	0.957	0.956	0.955	0.954	0.951	0.946	0.936	0.931	0.930	0.385		11

[a] *In this column, the first entry is water surface reading of the backwater gage; the second is the setting of the backwater gate.*

TABLE 33

BACKWATER PROFILE, CROSS-SECTION 5

Date: August 2, 1947 Discharge: 2.71 second-feet Normal depth: 1.158 feet

HOUR	TEMP. Air / Water	BW[a]	GAGE IDENTIFICATION 0	1	2	3	4	5	6	7	8	9	10	11	12	13	CCl_4	$2CHBr_2$	RUN NO.
	80°	1.183	NORMAL DEPTH READINGS--NO BACKWATER																
9:10 am	81°	0.914	1.168	1.168	1.159	1.153	1.156	1.143	1.143	1.150	1.154	1.165	1.167	1.161	1.164	1.158	0.80	0.24	0
			BACKWATER PROFILE																
	80°	2.698	439	449	459	469	479		499		519		539	549	559	569			
9:40	81°	2.460	2.680	2.653	2.619	2.592	2.564		2.506		2.444		2.383	2.355	2.326	2.295		0.24	1
	76°	2.402	539	549	559	569	579		599		619		639	649	659	669			
10:00	81°	2.158	2.384	2.356	2.323	2.297	2.267		2.212		2.148		2.086	2.060	2.030	2.000	0.80		2
		2.103	639	649	659	669	679		699		719		739	749	759	769			
10:30		1.853	2.087	2.059	2.029	2.000	1.968		1.908		1.851		1.793	1.764	1.735	1.706		0.24	3
	77°	1.810	739	749	759	769	779		799		819		839	849	859	869			
10:55	81°	1.564	1.792	1.765	1.734	1.708	1.678		1.621		1.565		1.512	1.485	1.460	1.434	0.80		4
	79°	1.530	839	849	859	869	879	889	899	909	919	929	939	949	959	969			
11:30	81°	1.276	1.512	1.485	1.458	1.434	1.407	1.382	1.356	1.334	1.312	1.296	1.280	1.261	1.251	1.240		0.24	5
		1.372	899	909	919	929	939	949	959	969	979	989	999	1009	1019	1029			
11:55		1.115	1.357	1.334	1.312	1.293	1.271	1.252	1.234	1.223	1.213	1.210	1.206	1.192	1.192	1.196	0.80		6
		1.254	959	969	979	989	999	1009	1019	1029	1039	1049	1059	1069	1079	1089			
pm 12:20		0.995	1.237	1.225	1.213	1.201	1.191	1.177	1.170	1.172	1.170	1.177	1.177	1.170	1.166	1.168		0.24	7
	80°	1.182																	
12:30	81°	0.914	1.169	1.167	1.159	1.152	1.156	1.142	1.144	1.150	1.153	1.165	1.167	1.161	1.163	1.16	0.80	0.24	0

[a] *In this column, the first entry is water surface reading of the backwater gage; the second is the setting of the backwater gate.*

TABLE 34

BACKWATER PROFILE, CROSS-SECTION 5

Date: August 1, 1947 Discharge: 3.87 second-feet Normal depth: 1.285 feet

HOUR	TEMP. Air / Water	GAGE IDENTIFICATION																	RUN NO.
		BW[a]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	CCl_4	$2CHBr_2$	
		1.307	NORMAL DEPTH READINGS--NO BACKWATER																
9:40 am	77° / 80°	0.958	1.292	1.293	1.289	1.286	1.280	1.274	1.273	1.278	1.280	1.291	1.295	1.285	1.290	1.290	1.57	0.47	0
		BACKWATER PROFILE																	
		2.780	413	423	433	443	453		473		493		513	523	533	543			
10:05		2.460	2.763	2.736	2.702	2.676	2.648		2.590		2.527		2.466	2.438	2.410	2.379		0.46	1
	76°	2.484	513	523	533	543	553		573		593		613	623	633	643			
10:30	81°	2.160	2.468	2.440	2.405	2.380	2.352		2.296		2.232		2.172	2.145	2.116	2.087	1.58		2
		2.194	613	623	633	643	653		673		693		713	723	733	743			
10:50		1.862	2.175	2.144	2.114	2.088	2.061		1.997		1.940		1.882	1.854	1.826	1.799		0.46	3
	78°	1.910	713	723	733	743	753		773		793	803	813	823	833	843			
11:20	81°	1.579	1.882	1.856	1.825	1.798	1.770		1.714		1.658	1.632	1.607	1.580	1.557	1.532	1.57		4
		1.679	793	803	813	823	833		853		873	883	893	903	913	923			
11:45		1.351	1.658	1.632	1.606	1.581	1.555		1.504		1.461	1.440	1.424	1.403	1.383	1.372		0.46	5
pm	80°	1.477	873	883	893	903	913		933		953	963	973	983	993	1003			
12:25	82°	1.150	1.463	1.441	1.421	1.403	1.383		1.348		1.327	1.327	1.322	1.309	1.305	1.307	1.57		6
		1.343	953	963	973	983	993		1013		1033	1043	1053	1063	1073	1083			
12:45		1.016	1.338	1.327	1.315	1.307	1.300		1.285		1.287	1.297	1.298	1.290	1.292	1.293		0.46	7

[a] *In this column, the first entry is water surface reading of the backwater gage; the second is the setting of the backwater gate.*

TABLE 35

BACKWATER PROFILE, CROSS-SECTION 5

Date: July 31, 1947 Discharge: 11.30 second-feet Normal depth: 1.704 feet

HOUR	TEMP. Air	TEMP. Water	BW[a]	GAGE IDENTIFICATION 0	1	2	3	4	5	6	7	8	9	10	11	12	13	CCl_4	$2CHBr_2$	RUN NO.
			1.737	NORMAL DEPTH READINGS--NO BACKWATER																
12:01 pm	82°	82°	1.017	1.710	1.709	1.711	1.703	1.705	1.700	1.690	1.695	1.694	1.707	1.718	1.703	1.702	1.713		3.85	0
				WATER SURFACE PROFILE																
			0.702																	
4:02			0.015	1.430	1.500	1.528	1.558	1.590	1.599	1.613	1.630	1.652	1.669	1.673	1.677	1.682	1.701		3.88	8
			1.692																	
5:05			0.972	1.675	1.677	1.680	1.677	1.682	1.677	1.673	1.680	1.683	1.700	1.698	1.705	1.692	1.708		3.87	9
	83°		3.170	291	301	311	321	331		351		371		391	401	411	421			
12:30	82°		2.460	3.154	3.126	3.095	3.068	3.042		2.985		2.928		2.866	2.839	2.813	2.783		3.87	1
	82°		2.886	391	401	411	421	431		451		471		491	501	511	521			
1:00	82°		2.174	2.869	2.839	2.809	2.783	2.761		2.700		2.642		2.585	2.558	2.536	2.505		3.87	2
	82°		2.607	491	501	511	521	531		551		571		591	601	611	621			
1:25	82°		1.900	2.588	2.562	2.532	2.503	2.480		2.423		2.369		2.315	2.291	2.268	2.243		3.87	3
	81°		2.347	591	601	611	621	631		651		671		691	701	711	721			
1:50	82°		1.666	2.318	2.293	2.267	2.240	2.220		2.169		2.116		2.072	2.050	2.029	2.010		3.86	4
	81°		2.105	691	701	711	721	731		751		771		791	801	811	821			
2:20	82°		1.433	2.072	2.051	2.030	2.008	1.985		1.938		1.902		1.875	1.860	1.848	1.838		3.87	5
	81°		1.912	791	801	811	821	831		851		871	881	891	901	911	921			
2:50	82°		1.238	1.878	1.862	1.848	1.834	1.820		1.787		1.770	1.766	1.760	1.745	1.745	1.742		3.87	6
	82°		1.808	871	881	891	901	911		931		951	961	971	981	991	1001			
3:15	82°		1.130	1.773	1.765	1.758	1.748	1.744		1.721		1.716	1.726	1.733	1.709	1.722	1.720		3.87	7
			1.743																	
3:40	82°		1.017	1.720	1.714	1.711	1.704	1.706	1.700	1.690	1.695	1.695	1.704	1.717	1.702	1.701	1.712		3.88	0

[a] *In this column the first entry is water surface reading of the backwater gage; the second is the setting of the backwater gate.*

TABLE 36

BACKWATER PROFILE, CROSS-SECTION 5

Date: July 25, 1947 Discharge: 31.28 second-feet Normal depth: 2.525 feet

HOUR	TEMP. Air	TEMP. Water	GAGE IDENTIFICATION																RUN NO.
			Bw[a]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	CCl_4	$2CHBr_2$	
			2.596	NORMAL DEPTH READINGS--NO BACKWATER															
10:45 am	78°	74°	1.210	2.532	2.526	2.528	2.528	2.526	2.519	2.515	2.519	2.515	2.528	2.524	2.521	2.540	2.530		2.01	0
			BACKWATER PROFILE																	
	75°		3.696	135	145	155	165	175		195		215	225	235	245	255	265			
11:35	78°		2.300	3.674	3.647	3.622	3.603	3.581		3.529		3.473	3.450	3.425	3.402	3.381	3.365		2.01	1
pm	75°		3.491	215	225	235	245	255	265	275		295		315	325	335	345			
12:15	78°		2.099	3.474	3.450	3.425	3.401	3.383	3.364	3.340		3.292		3.246	3.226	3.206	3.185		2.01	2
	76°		3.270	315	325	335	345	355		375		395		415	425	435	445			
1:00	79°		1.886	3.247	3.226	3.204	3.186	3.170		3.126		3.087		3.051	3.032	3.018	3.000		2.02	3
	76°		3.088	415	425	435	445	455		475		495		515	525	535	545			
2:15	79°		1.706	3.051	3.032	3.017	3.001	2.983		2.949		2.908		2.873	2.857	2.848	2.834		2.00	4
	77°		2.925	515	525	535	545	555		575		595		615	625	635	645			
3:15	80°		1.570	2.875	2.856	2.847	2.833	2.819		2.790		2.754		2.744	2.732	2.717	2.710		2.01	5
	77°		2.765	615	625	635	645	655		675		695		715	725	735	745			
3:30	80°		1.450	2.740	2.730	2.716	2.703	2.694		2.674		2.652		2.639	2.632	2.625	2.622		2.01	6
	77°		2.679	715	725	735	745	755		775		795		815	825	835	845			
4:15	80°		1.372	2.638	2.634	2.627	2.619	2.610		2.595		2.582		2.578	2.573	2.579	2.570		2.02	7
	77°		2.612	815	825	835	845	855	865	875	885	895	905	915	925	935	945			
5:00	80°		1.325	2.583	2.579	2.572	2.564	2.556	2.553	2.550	2.539	2.537	2.538	2.542	2.547	2.553	2.544		2.01	8

[a] *In this column, the first entry is water surface reading of the backwater gage; the second is the setting of the backwater gate.*

TABLE 37

BACKWATER PROFILE, CROSS-SECTION 6

Date: September 8, 1947 Discharge: 0.83 second-feet Normal depth: 0.471 feet

HOUR	TEMP. Air	Water	GAGE IDENTIFICATION PW[a]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	CCl_4 and Gas.	CCl_4	RUN NO.
			0.475							NORMAL DEPTH READINGS--NO BACKWATER										
11:35 am			0.373	0.470	0.472	0.473	0.460	0.470	0.466	0.476	0.476	0.481	0.482	0.477	0.470	0.463	0.463	0.165	0.070	0
										BACKWATER PROFILE										
pm	82°		2.504	503	513	523	533	543		563		583		603	613	623	633			
12:20	80.5°		2.460	2.487	2.456	2.425	2.398	2.368		2.314		2.250		2.189	2.162	2.130	2.098	0.225	0.090	1
			2.205	603	613	623	633	643		663		683		703	713	723	733			
1:00			2.149	2.191	2.159	2.127	2.101	2.071		2.016		1.948		1.887	1.860	1.830	1.799	0.225	0.090	2
	82°		1.904	703	713	723	733	743		763		783		803	813	823	833			
1:25	81°		1.829	1.889	1.860	1.828	1.800	1.768		1.711		1.650		1.591	1.563	1.532	1.502	0.220	0.095	3
	82°		1.608	803	813	823	833	843		863		883		903	913	923	933			
1:45	81°		1.520	1.592	1.563	1.531	1.503	1.472		1.415		1.356		1.298	1.271	1.240	1.212	0.215	0.090	4
			1.313	903	913	923	933	943		963		983		1003	1013	1023	1033			
2:05			1.218	1.298	1.269	1.240	1.212	1.184		1.129		1.078		1.027	1.002	0.978	0.952			5
	83°		1.042	1003	1013	1023	1033	1043	1053	1063	1073	1083	1093	1103	1113	1123	1133			
2:25	81°		0.943	1.029	1.002	0.975	0.951	0.922	0.898	0.875	0.851	0.828	0.806	0.782	0.759	0.736	0.713	0.170	0.080	6
			0.792	1103	1113	1123	1133	1143	1153	1163	1173	1183	1193	1203	1213	1223	1233			
2:50			0.692	0.780	0.758	0.736	0.714	0.692	0.673	0.657	0.638	0.623	0.609	0.593	0.576	0.561	0.546	0.165	0.080	7
	83°		0.600	1203	1213	1223	1233	1243	1253	1263	1273	1283	1293	1303	1313	1323	1333			
3:25	81°		0.497	0.591	0.576	0.563	0.546	0.538	0.527	0.524	0.516	0.515	0.510	0.502	0.490	0.480	0.481	0.165	0.080	8

[a] *In this column, the first entry is water surface reading of the backwater gage; the second is the setting of the backwater gate.*

TABLE 38

BACKWATER PROFILE, CROSS-SECTION 6

Date: Sept. 15, 1947 Discharge: 1.84 second-feet Normal depth: 0.905 feet

HOUR	TEMP. Air / Water	BW[a]	GAGE IDENTIFICATION 0	1	2	3	4	5	6	7	8	9	10	11	12	13	CCl_4 and Gas	CCl_4	RUN NO.
	74°	-----	NORMAL DEPTH READINGS--NO BACKWATER																
10:30 am	79°	0.730	0.904	0.909	0.907	0.900	0.906	0.900	0.907	0.907	0.909	0.908	0.909	0.904	0.901	0.904		0.375	0
			BACKWATER PROFILE																
	76°	2.622	463	473	483	493	503	513	523	533	543	553	563	573	583	593			
6:35 pm		2.466	2.607	2.576	2.545	2.519	2.495	2.462	2.434	2.399	2.370	2.341	2.309	2.279	2.249	2.219		0.390	11
	75°	2.326	563	573	583	593	603	613	623	633	643	653	663	673	683	693			
5:35		2.156	2.309	2.279	2.248	2.220	2.197	2.164	2.135	2.100	2.072	2.044	2.008	1.979	1.949	1.920		0.390	10
	75°	2.024	663	673	683	693	703	713	723	733	743	753	763	773	783	793			
5:00		1.849	2.008	1.979	1.948	1.921	1.893	1.860	1.830	1.799	1.772	1.745	1.714	1.684	1.653	1.623		0.400	9
		1.727	763	773	783	793	803	813	823	833	843	853	863	873	883	893			
11:30 am		1.546	1.710	1.684	1.653	1.626	1.598	1.566	1.537	1.508	1.480	1.453	1.425	1.397	1.369	1.343		0.385	1
pm	74°	1.580	813	823	833	843	853	863	873	883	893	903	913	923	933	943			
12:40	79°	1.397	1.566	1.538	1.508	1.481	1.454	1.423	1.395	1.369	1.341	1.316	1.292	1.265	1.242	1.221		0.395	2
		1.439	863	873	883	893	903	913	923	933	943	953	963	973	983	993			
1:20		1.248	1.423	1.396	1.368	1.341	1.318	1.288	1.263	1.239	1.217	1.197	1.177	1.155	1.135	1.125		0.380	3
	75°	1.305	913	923	933	943	953	963	973	983	993	1003	1013	1023	1033	1043			
2:00	79°	1.110	1.288	1.266	1.241	1.218	1.199	1.174	1.155	1.139	1.124	1.110	1.097	1.079	1.068	1.067		0.395	4
		1.188	963	973	983	993	1003	1013	1023	1033	1043	1053	1063	1073	1083	1093			
2:35		0.994	1.174	1.157	1.140	1.121	1.109	1.090	1.081	1.068	1.060	1.049	1.038	1.026	1.017	1.016		0.395	5
	75°	1.106	1013	1023	1033	1043	1053	1063	1073	1083	1093	1103	1113	1123	1133	1143			
3:15	79°	0.907	1.093	1.081	1.069	1.052	1.046	1.032	1.027	1.018	1.012	1.006	0.997	0.987	0.979	0.977		0.390	6
		1.044	1063	1073	1083	1093	1103	1113	1123	1133	1143	1153	1163	1173	1183	1193			
3:40		0.849	1.034	1.029	1.019	1.005	1.003	0.988	0.987	0.983	0.979	0.974	0.968	0.959	0.952	0.952		0.380	7
		1.001	1113	1123	1133	1143	1153	1163	1173	1183	1193	1203	1213	1223	1233	1243			
4:10		0.805	0.990	0.987	0.982	0.969	0.968	0.957	0.956	0.955	0.954	0.951	0.946	0.936	0.931	0.930		0.385	8

[a] *In this column, the first entry is water surface reading of the backwater gage; the second is the setting of the backwater gate.*

TABLE 39

BACKWATER PROFILE, CROSS-SECTION 6

Date: September 17, 1947 Discharge: 3.98 second-feet Normal depth: 1.294 feet

HOUR	TEMP. Air	TEMP. Water	BW[a]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	CCl_4	$2CHBr_2$	RUN NO.
										GAGE IDENTIFICATION										
										NORMAL DEPTH READINGS--NO BACKWATER										
9:40 am			0.954	1.280	1.303	1.302	1.295	1.297	1.288	1.288	1.290	1.291	1.302	1.303	1.293	1.292	1.294			0
										BACKWATER PROFILE										
		76°	2.782	412	422	432	442	452	462	472	482	492	502	512	522	532	542			
10:10		77°	2.460	2.766	2.736	2.705	2.678	2.647	2.621	2.593	2.560	2.530	2.500	2.470	2.441	2.411	2.381	1.54	0.47	1
		77°	2.487	512	522	532	542	552	562	572	582	592	602	612	622	632	642			
11:45		77.5°	2.160	2.471	2.441	2.410	2.382	2.354	2.327	2.297	2.264	2.237	2.208	2.177	2.148	2.118	2.089	1.55	0.46	2
pm			2.224	602	612	622	632	642	652	662	672	682	692	702	712	722	732			
12:20			1.891	2.207	2.177	2.147	2.119	2.091	2.059	2.029	1.998	1.971	1.944	1.914	1.885	1.857	1.830	1.56	0.47	3
		77.5°	1.962	692	702	712	722	732	742	752	762	772	782	792	802	812	822			
12:55		78°	1.640	1.944	1.916	1.887	1.858	1.827	1.801	1.773	1.743	1.718	1.692	1.665	1.638	1.611	1.586	1.56	0.465	4
			1.710	782	792	802	812	822	832	842	852	862	872	882	892	902	912			
1:20			1.384	1.690	1.665	1.639	1.612	1.586	1.561	1.534	1.510	1.489	1.470	1.450	1.428	1.408	1.394	1.56	0.465	5
		77.5°	1.581	832	842	852	862	872	882	892	902	912	922	932	942	952	962			
1:50		78°	1.252	1.558	1.538	1.513	1.490	1.467	1.446	1.424	1.403	1.390	1.379	1.369	1.350	1.338	1.333	1.58	0.465	6
			1.459	882	892	902	912	922	932	942	952	962	972	982	992	1002	1012			
2:15			1.131	1.440	1.430	1.409	1.391	1.374	1.359	1.345	1.333	1.328	1.330	1.322	1.312	1.306	1.305	1.56	0.46	7
		78°	1.366	932	942	952	962	972	982	992	1002	1012	1022	1032	1042	1052	1062			
2:50		78°	1.038	1.350	1.355	1.343	1.329	1.320	1.312	1.306	1.300	1.305	1.311	1.310	1.299	1.296	1.297	1.56	0.46	8
			1.292																	
3:30			0.948	1.278	1.304	1.302	1.295	1.295	1.290	1.288	1.288	1.293	1.304	1.304	1.295	1.295	1.295	1.56	0.47	0

[a] *In this column, the first entry is water surface reading of the backwater gage; the second is the setting of the backwater gate.*

TABLE 40

BACKWATER PROFILE, CROSS-SECTION 6

Date: Sept. 10, 1947 Discharge: 30.63 second-feet Normal depth: 2.431 feet

HOUR	TEMP. Air	Water	GAGE IDENTIFICATION																RUN NO.
		BW[a]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	CCl_4	$2CHBr_2$	
		2.539	NORMAL DEPTH READINGS--NO BACKWATER																
12:10 pm	82°	81°	1.125	2.423	2.418	2.429	2.436	2.432	2.424	2.426	2.435	2.425	2.422	2.428	2.440	2.420	2.470		2.04	0
			BACKWATER PROFILE																
	82°		3.690	131	141	151	161	171	181	191	201	211	221	231	241	251	261			
12:25	81°		2.300	3.670	3.639	3.609	3.580	3.553	3.525	3.498	3.471	3.447	3.422	3.397	3.372	3.345	3.320		2.02	1
			3.432	231	241	251	261	271	281	291	301	311	321	331	341	351	361			
1:00			2.030	3.396	3.370	3.346	3.321	3.296	3.271	3.243	3.217	3.188	3.167	3.144	3.122	3.098	3.074		2.03	2
	83°		3.180	331	341	351	361	371	381	391	401	411	421	431	441	451	461			
1:45	82.5°		1.796	3.144	3.121	3.098	3.074	3.054	3.032	3.009	2.984	2.961	2.938	2.912	2.893	2.874	2.863		2.02	3
			2.932	431	441	451	461	471	481	491	501	511	521	531	541	551	561			
2:25			1.606	2.913	2.894	2.874	2.859	2.840	2.822	2.801	2.780	2.763	2.745	2.725	2.703	2.687	2.674		2.02	4
			2.782	531	541	551	561	571	581	591	601	611	621	631	641	651	661			
3:05			1.445	2.719	2.703	2.692	2.678	2.666	2.652	2.640	2.624	2.609	2.600	2.590	2.586	2.580	2.569		2.04	5
	83.5°		2.660	621	631	641	651	661	671	681	691	701	711	721	731	741	751			
3:30	84°		1.333	2.604	2.593	2.584	2.576	2.563	2.550	2.534	2.523	2.515	2.510	2.500	2.500	2.495	2.490		2.04	6
			2.570	711	721	731	741	751	761	771	781	791	801	811	821	831	841			
4:25			1.268	2.510	2.502	2.494	2.489	2.475	2.468	2.458	2.450	2.448	2.450	2.444	2.455	2.438	2.483		2.04	7

[a] *In this column, the first entry is water surface reading of the backwater gage; the second is the setting of the backwater gate.*

TABLE 41

BACKWATER PROFILE, CROSS-SECTION 7

Date: Sept. 20, 1947 Discharge: 4.00 second-feet Normal depth: 1.295 feet

HOUR	TEMP. Air	TEMP. Water	GAGE IDENTIFICATION																	RUN NO.
			BW[a]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	CCl_4	$2CHBr_2$	
			1.295							NORMAL DEPTH READINGS--NO BACKWATER										
			0.947	1.280	1.304	1.304	1.296	1.296	1.288	1.289	1.294	1.293	1.299	1.305	1.293	1.293	1.293			0
										BACKWATER PROFILE										
		74°	2.782	411	421	431	441	451	461	471	481	491	501	511	521	531	541			
7:30 am		77°	2.460	2.765	2.736	2.704	2.677	2.647	2.620	2.593	2.560	2.530	2.500	2.470	2.441	2.410	2.380	1.56	0.47	1
			2.487	511	521	531	541	551	561	571	581	591	601	611	621	631	641			
8:00			2.161	2.471	2.441	2.408	2.382	2.353	2.325	2.297	2.267	2.235	2.205	2.176	2.146	2.117	2.087	1.55	0.47	2
		75°	2.224	601	611	621	631	641	651	661	671	681	691	701	711	721	731			
8:20		77°	1.892	2.205	2.176	2.144	2.119	2.090	2.064	2.028	2.000	1.968	1.938	1.913	1.883	1.853	1.825	1.55	0.46	3
			1.960	691	701	711	721	731	741	751	761	771	781	791	801	811	821			
8:55			1.638	1.940	1.914	1.884	1.856	1.826	1.798	1.770	1.744	1.716	1.685	1.663	1.635	1.607	1.583	1.55	0.47	4
		76.5°	1.706	781	791	801	811	821	831	841	851	861	871	881	891	901	911			
9:15		78°	1.382	1.685	1.662	1.635	1.607	1.582	1.558	1.531	1.510	1.484	1.460	1.442	1.420	1.404	1.387	1.56	0.47	5
			1.576	831	841	851	861	871	881	891	901	911	921	931	941	951	961			
9:30			1.249	1.554	1.534	1.509	1.486	1.461	1.441	1.419	1.403	1.385	1.371	1.359	1.344	1.335	1.329	1.56	0.47	6
		78°	1.456	881	891	901	911	921	931	941	951	961	971	981	991	1001	1011			
9:55		78°	1.128	1.436	1.423	1.406	1.386	1.370	1.356	1.341	1.335	1.324	1.324	1.322	1.310	1.304	1.303	1.56	0.47	7
			1.363	931	941	951	961	971	981	991	1001	1011	1021	1031	1041	1051	1061			
			1.036	1.345	1.349	1.338	1.327	1.318	1.309	1.303	1.306	1.301	1.303	1.306	1.297	1.294	1.295	1.56	0.475	8

[a] *In this column, the first entry is water surface reading of the backwater gage; the second is the setting of the backwater gate.*

TABLE 42

NORMAL DEPTH-DISCHARGE RATING, CROSS-SECTION 2

DEPTH feet	.00 cfs	DIFF. cfs	.01 cfs	.02 cfs	.03 cfs	.04 cfs	.05 cfs	.06 cfs	.07 cfs	.08 cfs	.09 cfs	DEPTH feet
0.1	0.33		0.40	0.47	0.55	0.63	0.72	0.81	0.91	1.01	1.11	0.1
0.2	1.22		1.33	1.45	1.57	1.69	1.82	1.95	2.08	2.22	2.36	0.2
0.3	2.50		2.64	2.79	2.94	3.09	3.24	3.40	3.56	3.72	3.88	0.3
0.4	4.05		4.21	4.38	4.56	4.73	4.91	5.08	5.26	5.44	5.63	0.4
0.5	5.81		6.00	6.18	6.37	6.56	6.76	6.95	7.15	7.34	7.54	0.5
0.6	7.74		7.95	8.15	8.36	8.56	8.77	8.98	9.20	9.41	9.63	0.6
0.7	9.84		10.06	10.28	10.50	10.72	10.95	11.17	11.40	11.62	11.86	0.7
0.8	12.09	2.39	12.33	12.57	12.81	13.05	13.28	13.52	13.76	14.00	14.24	0.8
0.9	14.48	2.50	14.73	14.98	15.23	15.48	15.73	15.98	16.23	16.48	16.73	0.9
1.0	16.98	2.59	17.24	17.50	17.76	18.02	18.28	18.53	18.79	19.05	19.31	1.0
1.1	19.57	2.66	19.84	20.10	20.37	20.63	20.90	21.17	21.43	21.70	21.96	1.1
1.2	22.23	2.72	22.50	22.77	23.05	23.32	23.59	23.86	24.13	24.41	24.68	1.2
1.3	24.95	2.77	25.23	25.50	25.78	26.06	26.34	26.61	26.89	27.17	27.44	1.3
1.4	27.72	2.81	28.00	28.28	28.56	28.84	29.12	29.41	29.69	29.97	30.25	1.4
1.5	30.53	2.85	30.82	31.10	31.38	31.67	31.96	32.24	32.52	32.81	33.10	1.5
1.6	33.38	2.89	33.67	33.96	34.25	34.54	34.82	35.11	35.40	35.69	35.98	1.6
1.7	36.27	2.93	36.56	36.86	37.15	37.44	37.74	38.03	38.32	38.61	38.91	1.7
1.8	39.20	2.97	39.50	39.79	40.09	40.39	40.68	40.98	41.28	41.58	41.87	1.8
1.9	42.17	3.01	42.47	42.77	43.07	43.37	43.68	43.98	44.28	44.58	44.88	1.9
2.0	45.18	3.05	45.48	45.79	46.10	46.40	46.70	47.01	47.32	47.62	47.92	2.0
2.1	48.23	3.09	48.54	48.85	49.16	49.47	49.78	50.1	50.4	50.7	51.0	2.1
2.2	51.3	3.13	51.6	51.9	52.3	52.6	52.9	53.2	53.5	53.8	54.1	2.2
2.3	54.4	3.17	54.8	55.1	55.4	55.7	56.0	56.4	56.7	57.0	57.3	2.3
2.4	57.6	3.21	57.9	58.3	58.6	58.9	59.2	59.5	59.9	60.2	60.5	2.4
2.5	60.8	3.25	61.2	61.5	61.8	62.1	62.5	62.8	63.1	63.4	63.8	2.5
2.6	64.1	3.29	64.4	64.7	65.1	65.4	65.7	66.1	66.4	66.7	67.0	2.6
2.7	67.4	3.33	67.7	68.0	68.4	68.7	69.0	69.4	69.7	70.0	70.4	2.7
2.8	70.7	3.36	71.0	71.4	71.7	72.0	72.4	72.7	73.1	73.4	73.7	2.8
2.9	74.1	3.39	74.4	74.7	75.1	75.4	75.8	76.1	76.4	76.8	77.1	2.9
3.0	77.4	3.42	77.8	78.1	78.5	78.8	79.2	79.5	79.8	80.2	80.5	3.0
3.1	80.9	3.45	81.2	81.6	81.9	82.2	82.6	82.9	83.3	83.6	84.0	3.1
3.2	84.3	3.48	84.7	85.0	85.4	85.7	86.1	86.4	86.8	87.1	87.5	3.2
3.3	87.8	3.51	88.2	88.5	88.9	89.2	89.6	89.9	90.3	90.6	91.0	3.3
3.4	91.3	3.54	91.7	92.0	92.4	92.7	93.1	93.4	93.8	94.1	94.5	3.4
3.5	94.8	3.57	95.2	95.6	95.9	96.3	96.6	97.0	97.3	97.7	98.1	3.5
3.6	98.4	3.60	98.8	99.1	99.5	99.9	100	101	101	101	102	3.6
3.7	102	3.63	102	103	103	103	104	104	105	105	105	3.7
3.8	106	3.66	106	106	107	107	107	108	108	109	109	3.8
3.9	109	3.69	110	110	110	111	111	112	112	112	113	3.9
4.0	113											

Notes: Hundredths values computed by straight-line interpolation except within the range marked "Curvilinear." Discharges above 50 second-feet rounded from values computed to hundredths by addition of differences shown. The rating is based on 14 series of discharge measurements and on 10 simultaneous observations of normal depth and differential gages.

TABLE 43

NORMAL DEPTH-DISCHARGE RATING, CROSS-SECTION 3

DEPTH feet	.00 cfs	DIFF. cfs	.01 cfs	.02 cfs	.03 cfs	.04 cfs	.05 cfs	.06 cfs	.07 cfs	.08 cfs	.09 cfs	DEPTH feet
0.4	3.71	Curvilinear	3.87	4.03	4.19	4.35	4.52	4.69	4.86	5.03	5.20	0.4
0.5	5.38		5.56	5.74	5.92	6.10	6.29	6.48	6.67	6.86	7.05	0.5
0.6	7.25		7.45	7.65	7.85	8.05	8.25	8.46	8.67	8.88	9.09	0.6
0.7	9.30		9.51	9.73	9.95	10.17	10.39	10.61	10.83	11.05	11.28	0.7
0.8	11.51	2.34	11.74	11.98	12.21	12.45	12.68	12.91	13.15	13.38	13.62	0.8
0.9	13.85	2.45	14.10	14.34	14.58	14.83	15.08	15.32	15.56	15.81	16.06	0.9
1.0	16.30	2.54	16.55	16.81	17.06	17.32	17.57	17.82	18.08	18.33	18.59	1.0
1.1	18.84	2.61	19.10	19.36	19.62	19.88	20.14	20.41	20.67	20.93	21.19	1.1
1.2	21.45	2.66	21.72	21.98	22.25	22.51	22.78	23.05	23.31	23.58	23.84	1.2
1.3	24.11	2.70	24.38	24.65	24.92	25.19	25.46	25.73	26.00	26.27	26.54	1.3
1.4	26.81	2.74	27.08	27.36	27.63	27.91	28.18	28.45	28.73	29.00	29.28	1.4
1.5	29.55	2.12	29.76	29.97	30.19	30.40	30.61	30.82	31.03	31.25	31.46	1.5
1.6	31.67	2.18	31.88	32.10	32.31	32.52	32.74	32.95	33.16	33.37	33.59	1.6
1.7	33.80	2.15	34.02	34.23	34.44	34.66	34.88	35.09	35.30	35.52	35.74	1.7
1.8	35.95	2.16	36.17	36.38	36.60	36.81	37.03	37.25	37.46	37.68	37.89	1.8
1.9	38.11	2.17	38.33	38.54	38.76	38.98	39.20	39.41	39.63	39.85	40.06	1.9
2.0	40.28	2.19	40.50	40.72	40.94	41.16	41.38	41.59	41.81	42.03	42.25	2.0
2.1	42.47	2.21	42.69	42.91	43.13	43.35	43.58	43.80	44.02	44.24	44.46	2.1
2.2	44.68	2.22	44.90	45.12	45.35	45.57	45.79	46.01	46.23	46.46	46.68	2.2
2.3	46.90	2.23	47.12	47.35	47.57	47.79	48.02	48.24	48.46	48.68	48.91	2.3
2.4	49.13	2.24	49.35	49.58	49.80	50.0	50.2	50.5	50.7	50.9	51.1	2.4
2.5	51.4	2.26	51.6	51.8	52.0	52.3	52.5	52.7	53.0	53.2	53.4	2.5
2.6	53.6	2.27	53.9	54.1	54.3	54.5	54.8	55.0	55.2	55.4	55.7	2.6
2.7	55.9	2.29	56.1	56.4	56.6	56.8	57.0	57.3	57.5	57.7	58.0	2.7
2.8	58.2	2.30	58.4	58.6	58.9	59.1	59.3	59.6	59.8	60.0	60.3	2.8
2.9	60.5	2.31	60.7	61.0	61.2	61.4	61.6	61.9	62.1	62.3	62.6	2.9
3.0	62.8	2.32	63.0	63.3	63.5	63.7	64.0	64.2	64.4	64.7	64.9	3.0
3.1	65.1	2.33	65.4	65.6	65.8	66.1	66.3	66.5	66.8	67.0	67.2	3.1
3.2	67.4	2.35	67.7	67.9	68.2	68.4	68.6	68.9	69.1	69.3	69.6	3.2
3.3	69.8	2.35	70.0	70.3	70.5	70.7	71.0	71.2	71.4	71.7	71.9	3.3
3.4	72.2	2.36	72.4	72.6	72.9	73.1	73.3	73.6	73.8	74.0	74.3	3.4
3.5	74.5	2.37	74.7	75.0	75.2	75.5	75.7	75.9	76.2	76.4	76.6	3.5
3.6	76.9	2.38	77.1	77.4	77.6	77.8	78.1	78.3	78.5	78.8	79.0	3.6
3.7	79.3	2.39	79.5	79.7	80.0	80.2	80.5	80.7	80.9	81.2	81.4	3.7
3.8	81.6	2.39	81.9	82.1	82.4	82.6	82.8	83.1	83.3	83.6	83.8	3.8
3.9	84.0	2.40	84.3	84.5	84.8	85.0	85.2	85.5	85.7	86.0	86.2	3.9
4.0	86.4											

Notes: Hundredths values computed by straight-line interpolation except within the range marked "Curvilinear". Discharges above 50 second-feet rounded from values computed to hundredths by addition of differences shown. The rating is based on 7 series of discharge measurements and on 14 simultaneous observations of normal depth and differential gages.

TABLE 44

NORMAL DEPTH-DISCHARGE RATING, CROSS-SECTION 4

DEPTH feet	.00 cfs	DIFF. cfs	.01 cfs	.02 cfs	.03 cfs	.04 cfs	.05 cfs	.06 cfs	.07 cfs	.08 cfs	.09 cfs	DEPTH feet
0.4	2.29		2.40	2.50	2.61	2.73	2.84	2.96	3.07	3.19	3.32	0.4
0.5	3.44		3.57	3.69	3.82	3.96	4.09	4.23	4.36	4.50	4.64	0.5
0.6	4.79		4.93	5.08	5.22	5.37	5.52	5.68	5.83	5.99	6.14	0.6
0.7	6.30	Curvilinear	6.46	6.62	6.79	6.95	7.12	7.28	7.45	7.62	7.79	0.7
0.8	7.96		8.14	8.31	8.49	8.66	8.84	9.02	9.20	9.38	9.57	0.8
0.9	9.75	1.89	9.94	10.13	10.32	10.51	10.70	10.88	11.07	11.26	11.45	0.9
1.0	11.64	1.96	11.84	12.03	12.22	12.42	12.62	12.81	13.00	13.20	13.40	1.0
1.1	13.59	2.02	13.79	13.99	14.20	14.40	14.60	14.80	15.00	15.21	15.41	1.1
1.2	15.61	2.05	15.82	16.02	16.22	16.43	16.64	16.84	17.04	17.25	17.46	1.2
1.3	17.66	2.09	17.87	18.08	18.29	18.50	18.70	18.91	19.12	19.33	19.54	1.3
1.4	19.75	2.10	19.96	20.17	20.38	20.59	20.80	21.01	21.22	21.43	21.64	1.4
1.5	21.85	2.12	22.06	22.27	22.49	22.70	22.91	23.12	23.33	23.55	23.76	1.5
1.6	23.97	2.13	24.18	24.40	24.61	24.82	25.04	25.25	25.46	25.67	25.89	1.6
1.7	26.10	2.15	26.32	26.53	26.74	26.96	27.18	27.39	27.60	27.82	28.04	1.7
1.8	28.25	2.16	28.47	28.68	28.90	29.11	29.33	29.55	29.76	29.98	30.19	1.8
1.9	30.41	2.17	30.63	30.84	31.06	31.28	31.50	31.71	31.93	32.15	32.36	1.9
2.0	32.58	2.19	32.80	33.02	33.24	33.46	33.68	33.89	34.11	34.33	34.55	2.0
2.1	34.77	2.21	34.99	35.21	35.43	35.65	35.88	36.10	36.32	36.54	36.76	2.1
2.2	36.98	2.22	37.20	37.42	37.65	37.87	38.09	38.31	38.53	38.76	38.98	2.2
2.3	39.20	2.23	39.42	39.65	39.87	40.09	40.32	40.54	40.76	40.98	41.21	2.3
2.4	41.43	2.24	41.65	41.88	42.10	42.33	42.55	42.77	43.00	43.22	43.45	2.4
2.5	43.67	2.26	43.90	44.12	44.35	44.57	44.80	45.03	45.25	45.48	45.70	2.5
2.6	45.93	2.27	46.16	46.38	46.61	46.84	47.06	47.29	47.52	47.75	47.97	2.6
2.7	48.20	2.29	48.43	48.66	48.89	49.12	49.34	49.57	49.80	50.0	50.3	2.7
2.8	50.5	2.30	50.7	51.0	51.2	51.4	51.6	51.9	52.1	52.3	52.6	2.8
2.9	52.8	2.31	53.0	53.3	53.5	53.7	53.9	54.2	54.4	54.6	54.9	2.9
3.0	55.1	2.32	55.3	55.6	55.8	56.0	56.3	56.5	56.7	57.0	57.2	3.0
3.1	57.4	2.33	57.7	57.9	58.1	58.4	58.6	58.8	59.1	59.3	59.5	3.1
3.2	59.8	2.35	60.0	60.2	60.5	60.7	60.9	61.2	61.4	61.6	61.9	3.2
3.3	62.1	2.35	62.3	62.6	62.8	63.0	63.3	63.5	63.7	64.0	64.2	3.3
3.4	64.4	2.36	64.7	64.9	65.2	65.4	65.6	65.9	66.1	66.3	66.6	3.4
3.5	66.8	2.37	67.0	67.3	67.5	67.8	68.0	68.2	68.5	68.7	68.9	3.5
3.6	69.2	2.38	69.4	69.7	69.9	70.1	70.4	70.6	70.8	71.1	71.3	3.6
3.7	71.6	2.39	71.8	72.0	72.3	72.5	72.8	73.0	73.2	73.5	73.7	3.7
3.8	74.0	2.39	74.2	74.4	74.7	74.9	75.1	75.4	75.6	75.9	76.1	3.8
3.9	76.3	2.40	76.6	76.8	77.1	77.3	77.5	77.8	78.0	78.3	78.5	3.9
4.0	78.7											

Notes: Hundredths values computed by straight-line interpolation except within the range marked "Curvilinear". Discharges above 50 second-feet rounded from values computed to hundredths by addition of differences shown. The rating is based on 1 series of discharge measurements and on 13 simultaneous observations of normal depth and differential gages.

TABLE 45

NORMAL DEPTH-DISCHARGE RATING, CROSS-SECTION 5

DEPTH feet	.00 cfs	DIFF. cfs	.01 cfs	.02 cfs	.03 cfs	.04 cfs	.05 cfs	.06 cfs	.07 cfs	.08 cfs	.09 cfs	DEPTH feet
0.4	0.67	0.22	0.69	0.71	0.74	0.76	0.78	0.80	0.82	0.85	0.87	0.4
0.5	0.89	0.23	0.91	0.94	0.96	0.98	1.00	1.03	1.05	1.07	1.10	0.5
0.6	1.12	0.23	1.14	1.17	1.19	1.21	1.24	1.26	1.28	1.30	1.33	0.6
0.7	1.35	0.24	1.37	1.40	1.42	1.45	1.47	1.49	1.52	1.54	1.57	0.7
0.8	1.59	0.24	1.61	1.64	1.66	1.69	1.71	1.73	1.76	1.78	1.81	0.8
0.9	1.83	0.24	1.85	1.88	1.90	1.93	1.95	1.97	2.00	2.02	2.05	0.9
1.0	2.07		2.09	2.12	2.14	2.17	2.20	2.23	2.27	2.31	2.35	1.0
1.1	2.39		2.44	2.49	2.54	2.60	2.66	2.72	2.79	2.86	2.93	1.1
1.2	3.01		3.09	3.18	3.27	3.37	3.47	3.58	3.69	3.81	3.93	1.2
1.3	4.06		4.19	4.33	4.47	4.61	4.76	4.91	5.06	5.21	5.37	1.3
1.4	5.53		5.69	5.85	6.02	6.19	6.36	6.53	6.70	6.88	7.06	1.4
1.5	7.24	Curvilinear	7.42	7.60	7.79	7.98	8.17	8.36	8.55	8.75	8.95	1.5
1.6	9.15		9.35	9.55	9.75	9.96	10.17	10.38	10.59	10.80	11.01	1.6
1.7	11.22		11.43	11.65	11.87	12.09	12.31	12.53	12.75	12.97	13.19	1.7
1.8	13.41	2.26	13.64	13.86	14.09	14.31	14.54	14.77	14.99	15.22	15.44	1.8
1.9	15.67	2.34	15.90	16.14	16.37	16.61	16.84	17.07	17.31	17.54	17.78	1.9
2.0	18.01	2.40	18.25	18.49	18.73	18.97	19.21	19.45	19.69	19.93	20.17	2.0
2.1	20.41	2.46	20.66	20.90	21.15	21.39	21.64	21.89	22.13	22.38	22.62	2.1
2.2	22.87	2.52	23.12	23.37	23.63	23.88	24.13	24.38	24.63	24.89	25.14	2.2
2.3	25.39	2.58	25.65	25.91	26.16	26.42	26.68	26.94	27.20	27.45	27.71	2.3
2.4	27.97	2.64	28.23	28.50	28.76	29.03	29.29	29.55	29.82	30.08	30.35	2.4
2.5	30.61	2.70	30.88	31.15	31.42	31.69	31.96	32.23	32.50	32.77	33.04	2.5
2.6	33.31	2.75	33.58	33.86	34.14	34.41	34.68	34.96	35.24	35.51	35.78	2.6
2.7	36.06	2.80	36.34	36.62	36.90	37.18	37.46	37.74	38.02	38.30	38.58	2.7
2.8	38.86	2.85	39.14	39.43	39.72	40.00	40.28	40.57	40.86	41.14	41.42	2.8
2.9	41.71	2.90	42.00	42.29	42.58	42.87	43.16	43.45	43.74	44.03	44.32	2.9
3.0	44.61	2.94	44.90	45.20	45.49	45.79	46.08	46.37	46.67	46.96	47.26	3.0
3.1	47.55	2.99	47.85	48.15	48.45	48.75	49.04	49.34	49.64	49.94	50.2	3.1
3.2	50.5	3.03	50.8	51.1	51.4	51.8	52.1	52.4	52.7	53.0	53.3	3.2
3.3	53.6	3.06	53.9	54.2	54.5	54.8	55.1	55.4	55.7	56.0	56.3	3.3
3.4	56.6	3.08	56.9	57.2	57.6	57.9	58.2	58.5	58.8	59.1	59.4	3.4
3.5	59.7	3.09	60.0	60.3	60.6	60.9	61.3	61.6	61.9	62.2	62.5	3.5
3.6	62.8	3.09	63.1	63.4	63.7	64.0	64.3	64.7	65.0	65.3	65.6	3.6
3.7	65.9	3.10	66.2	66.5	66.8	67.1	67.4	67.8	68.1	68.4	68.7	3.7
3.8	69.0	3.11	69.3	69.6	69.9	70.2	70.5	70.9	71.2	71.5	71.8	3.8
3.9	72.1	3.11	72.4	72.7	73.0	73.3	73.7	74.0	74.3	74.6	74.9	3.9
4.0	75.2											

Notes: Hundredths values computed by straight-line interpolation except within the range marked "Curvilinear". Discharges above 50 second-feet rounded from values computed to hundredths by addition of differences shown. The rating is based on 8 series of discharge measurements and on 20 simultaneous observations of normal depth and differential gages.

TABLE 46

NORMAL DEPTH-DISCHARGE RATING, CROSS-SECTION 6

DEPTH feet	.00 cfs	DIFF. cfs	.01 cfs	.02 cfs	.03 cfs	.04 cfs	.05 cfs	.06 cfs	.07 cfs	.08 cfs	.09 cfs	DEPTH feet
0.4	0.67	0.22	0.69	0.71	0.74	0.76	0.78	0.80	0.82	0.85	0.87	0.4
0.5	0.89	0.23	0.91	0.94	0.96	0.98	1.00	1.03	1.05	1.07	1.10	0.5
0.6	1.12	0.23	1.14	1.17	1.19	1.21	1.24	1.26	1.28	1.30	1.33	0.6
0.7	1.35	0.24	1.37	1.40	1.42	1.45	1.47	1.49	1.52	1.54	1.57	0.7
0.8	1.59	0.24	1.61	1.64	1.66	1.69	1.71	1.73	1.76	1.78	1.81	0.8
0.9	1.83	0.24	1.85	1.88	1.90	1.93	1.95	1.97	2.00	2.02	2.05	0.9
1.0	2.07	Curvilinear	2.09	2.12	2.14	2.17	2.20	2.23	2.27	2.31	2.35	1.0
1.1	2.39		2.44	2.49	2.54	2.60	2.66	2.72	2.79	2.86	2.93	1.1
1.2	3.01		3.09	3.18	3.27	3.37	3.47	3.58	3.69	3.81	3.93	1.2
1.3	4.06		4.19	4.33	4.47	4.61	4.76	4.91	5.06	5.21	5.37	1.3
1.4	5.53		5.69	5.85	6.02	6.19	6.36	6.53	6.70	6.88	7.06	1.4
1.5	7.24		7.42	7.60	7.79	7.98	8.17	8.36	8.55	8.75	8.95	1.5
1.6	9.15		9.35	9.55	9.75	9.96	10.17	10.38	10.59	10.80	11.02	1.6
1.7	11.24		11.46	11.68	11.90	12.12	12.34	12.57	12.80	13.03	13.26	1.7
1.8	13.49	2.39	13.73	13.97	14.21	14.45	14.68	14.92	15.16	15.40	15.64	1.8
1.9	15.88	2.52	16.13	16.38	16.64	16.89	17.14	17.39	17.64	17.90	18.15	1.9
2.0	18.40	2.64	18.66	18.93	19.19	19.46	19.72	19.98	20.25	20.51	20.78	2.0
2.1	21.04	2.76	21.32	21.59	21.87	22.14	22.42	22.70	22.97	23.25	23.52	2.1
2.2	23.80	2.88	24.09	24.38	24.66	24.95	25.24	25.53	25.82	26.10	26.39	2.2
2.3	26.68	2.99	26.98	27.28	27.58	27.88	28.18	28.47	28.77	29.07	29.37	2.3
2.4	29.67	3.10	29.98	30.29	30.60	30.91	31.22	31.53	31.84	32.15	32.46	2.4
2.5	32.77	3.21	33.09	33.41	33.73	34.05	34.38	34.70	35.02	35.34	35.66	2.5
2.6	35.98	3.32	36.31	36.64	36.98	37.31	37.64	37.97	38.30	38.64	38.97	2.6
2.7	39.30	3.45	39.64	39.98	40.33	40.67	41.01	41.35	41.69	42.04	42.38	2.7
2.8	42.72	3.52	43.07	43.42	43.78	44.13	44.48	44.83	45.18	45.54	45.89	2.8
2.9	46.24	3.62	46.60	46.96	47.33	47.69	48.05	48.41	48.77	49.14	49.50	2.9
3.0	49.86	3.71	50.2	50.6	51.0	51.3	51.7	52.1	52.5	52.8	53.2	3.0
3.1	53.6	3.80	54.0	54.3	54.7	55.1	55.5	55.8	56.2	56.6	57.0	3.1
3.2	57.4	3.88	57.8	58.1	58.5	58.9	59.3	59.7	60.1	60.5	60.9	3.2
3.3	61.2	3.95	61.6	62.0	62.4	62.8	63.2	63.6	64.0	64.4	64.8	3.3
3.4	65.2	4.01	65.6	66.0	66.4	66.8	67.2	67.6	68.0	68.4	68.8	3.4
3.5	69.2	4.06	69.6	70.0	70.4	70.8	71.2	71.6	72.1	72.5	72.9	3.5
3.6	73.3	4.10	73.7	74.1	74.5	74.9	75.3	75.7	76.1	76.6	77.0	3.6
3.7	77.4	4.13	77.8	78.2	78.6	79.0	79.4	79.8	80.3	80.7	81.1	3.7
3.8	81.5	4.16	81.9	82.3	82.7	83.2	83.6	84.0	84.4	84.8	85.2	3.8
3.9	85.7	4.19	86.1	86.5	86.9	87.3	87.8	88.2	88.6	89.0	89.4	3.9
4.0	89.8											

Notes: Hundredths values computed by straight-line interpolation except within the range marked "Curvilinear". Discharges above 50 second-feet rounded from values computed to hundredths by addition of differences shown. The rating is based on 8 series of discharge measurements and on 14 simultaneous observations of normal depth and differential gages.

TABLE 47

RATING FOR DIFFERENTIAL GAGE, 12-INCH LINE

(To obtain the discharge for the CCl_4 and gasoline mixture, multiply the tabular value by 0.6198; for $2CHBr_2$, multiply the tabular value by 1.854.)

CCl_4 feet	.00 cfs	DIFF. cfs	.01 cfs	.02 cfs	.03 cfs	.04 cfs	.05 cfs	.06 cfs	.07 cfs	.08 cfs	.09 cfs	CCl_4 feet
0	0	Curvilinear	0.29	0.42	0.51	0.60	0.67	0.73	0.79	0.85	0.90	0
0.1	0.95		1.00	1.04	1.09	1.13	1.17	1.21	1.25	1.28	1.32	0.1
0.2	1.35		1.39	1.42	1.45	1.49	1.52	1.55	1.58	1.61	1.64	0.2
0.3	1.66		1.69	1.72	1.75	1.77	1.80	1.83	1.85	1.88	1.90	0.3
0.4	1.93		1.95	1.98	2.00	2.02	2.05	2.07	2.09	2.11	2.14	0.4
0.5	2.16	0.21	2.18	2.20	2.22	2.24	2.26	2.29	2.31	2.33	2.35	0.5
0.6	2.37	0.19	2.39	2.41	2.43	2.45	2.46	2.48	2.50	2.52	2.54	0.6
0.7	2.56	0.18	2.58	2.60	2.61	2.63	2.65	2.67	2.69	2.70	2.72	0.7
0.8	2.74	0.17	2.76	2.77	2.79	2.81	2.82	2.84	2.86	2.88	2.89	0.8
0.9	2.91	0.17	2.93	2.94	2.96	2.98	3.00	3.01	3.03	3.05	3.06	0.9
1.0	3.08	0.15	3.10	3.11	3.12	3.14	3.16	3.17	3.18	3.20	3.22	1.0
1.1	3.23	0.14	3.24	3.26	3.27	3.29	3.30	3.31	3.33	3.34	3.36	1.1
1.2	3.37	0.15	3.38	3.40	3.42	3.43	3.44	3.46	3.48	3.49	3.50	1.2
1.3	3.52	0.13	3.53	3.55	3.56	3.57	3.58	3.60	3.61	3.62	3.64	1.3
1.4	3.65	0.13	3.66	3.68	3.69	3.70	3.72	3.73	3.74	3.75	3.77	1.4
1.5	3.78	0.13	3.79	3.81	3.82	3.83	3.84	3.86	3.87	3.88	3.90	1.5
1.6	3.91	0.12	3.92	3.93	3.95	3.96	3.97	3.98	3.99	4.01	4.02	1.6
1.7	4.03	0.12	4.04	4.05	4.07	4.08	4.09	4.10	4.11	4.13	4.14	1.7
1.8	4.15	0.12	4.16	4.17	4.19	4.20	4.21	4.22	4.23	4.25	4.26	1.8
1.9	4.27	0.11	4.28	4.29	4.30	4.31	4.32	4.34	4.35	4.36	4.37	1.9
2.0	4.38	0.11	4.39	4.40	4.41	4.42	4.44	4.45	4.46	4.47	4.48	2.0
2.1	4.49	0.11	4.50	4.51	4.52	4.53	4.54	4.56	4.57	4.58	4.59	2.1
2.2	4.60	0.10	4.61	4.62	4.63	4.64	4.65	4.66	4.67	4.68	4.69	2.2
2.3	4.70	0.11	4.71	4.72	4.73	4.74	4.76	4.77	4.78	4.79	4.80	2.3
2.4	4.81	0.10	4.82	4.83	4.84	4.85	4.86	4.87	4.88	4.89	4.90	2.4
2.5	4.91	0.10	4.92	4.93	4.94	4.95	4.96	4.97	4.98	4.99	5.00	2.5
2.6	5.01	0.09	5.02	5.03	5.04	5.05	5.06	5.06	5.07	5.08	5.09	2.6
2.7	5.10	0.10	5.11	5.12	5.13	5.14	5.15	5.16	5.17	5.18	5.19	2.7
2.8	5.20	0.09	5.21	5.22	5.23	5.24	5.24	5.25	5.26	5.27	5.28	2.8
2.9	5.29	0.09	5.30	5.31	5.32	5.33	5.34	5.34	5.35	5.36	5.37	2.9
3.0	5.38	0.10	5.39	5.40	5.41	5.42	5.43	5.44	5.45	5.46	5.47	3.0
3.1	5.48	0.09	5.49	5.50	5.51	5.52	5.52	5.53	5.54	5.55	5.56	3.1
3.2	5.57	0.08	5.58	5.59	5.59	5.60	5.61	5.62	5.63	5.63	5.64	3.2
3.3	5.65	0.09	5.66	5.67	5.68	5.69	5.70	5.70	5.71	5.72	5.73	3.3
3.4	5.74	0.09	5.75	5.76	5.77	5.78	5.78	5.79	5.80	5.81	5.82	3.4
3.5	5.83	0.08	5.84	5.85	5.85	5.86	5.87	5.88	5.89	5.89	5.90	3.5
3.6	5.91	0.08	5.92	5.93	5.93	5.94	5.95	5.96	5.97	5.97	5.98	3.6
3.7	5.99	0.08	6.00	6.01	6.01	6.02	6.03	6.04	6.05	6.05	6.06	3.7
3.8	6.07	0.09	6.08	6.09	6.10	6.11	6.12	6.12	6.13	6.14	6.15	3.8
3.9	6.16	0.08	6.17	6.18	6.18	6.19	6.20	6.21	6.22	6.22	6.23	3.9
4.0	6.24	0.07	6.25	6.25	6.26	6.27	6.28	6.28	6.29	6.30	6.30	4.0
4.1	6.31	0.08	6.32	6.33	6.33	6.34	6.35	6.36	6.37	6.37	6.38	4.1
4.2	6.39	0.08	6.40	6.41	6.41	6.42	6.43	6.44	6.45	6.45	6.46	4.2
4.3	6.47	0.08	6.48	6.49	6.49	6.50	6.51	6.52	6.53	6.53	6.54	4.3
4.4	6.55	0.07	6.56	6.56	6.57	6.58	6.58	6.59	6.60	6.61	6.61	4.4

Notes: Hundredths values computed by straight-line interpolation except within the range marked "Curvilinear." The rating is based on 22 series of discharge measurements made during 1944-47.

TABLE 48

RATING FOR DIFFERENTIAL GAGE, 24-INCH LINE

$2CHBr_2$ feet	.00 cfs	DIFF. cfs	.01 cfs	.02 cfs	.03 cfs	.04 cfs	.05 cfs	.06 cfs	.07 cfs	.08 cfs	.09 cfs	$2CHBr_2$ feet
0	0	Curvilinear	2.29	3.22	3.94	4.55	5.08	5.55	5.98	6.38	6.76	0
0.1	7.12		7.46	7.78	8.09	8.39	8.68	8.96	9.23	9.50	9.76	0.1
0.2	10.01		10.26	10.50	10.73	10.96	11.18	11.40	11.61	11.82	12.03	0.2
0.3	12.23		12.43	12.63	12.82	13.01	13.20	13.38	13.56	13.74	13.92	0.3
0.4	14.09		14.26	14.43	14.60	14.77	14.93	15.09	15.25	15.41	15.57	0.4
0.5	15.73	1.48	15.88	16.03	16.17	16.32	16.47	16.62	16.77	16.91	17.06	0.5
0.6	17.21	1.36	17.35	17.48	17.62	17.75	17.89	18.03	18.16	18.30	18.43	0.6
0.7	18.57	1.26	18.70	18.82	18.95	19.07	19.20	19.33	19.45	19.58	19.70	0.7
0.8	19.83	1.18	19.95	20.07	20.18	20.30	20.42	20.54	20.66	20.77	20.89	0.8
0.9	21.01	1.12	21.12	21.23	21.35	21.46	21.57	21.68	21.79	21.91	22.02	0.9
1.0	22.13	1.07	22.24	22.34	22.45	22.56	22.66	22.77	22.88	22.99	23.09	1.0
1.1	23.20	1.02	23.30	23.40	23.51	23.61	23.71	23.81	23.91	24.02	24.12	1.1
1.2	24.22	0.98	24.32	24.42	24.51	24.61	24.71	24.81	24.91	25.00	25.10	1.2
1.3	25.20	0.94	25.29	25.39	25.48	25.58	25.67	25.76	25.86	25.95	26.05	1.3
1.4	26.14	0.90	26.23	26.32	26.41	26.50	26.59	26.68	26.77	26.86	26.95	1.4
1.5	27.04	0.87	27.13	27.21	27.30	27.39	27.48	27.56	27.65	27.74	27.82	1.5
1.6	27.91	0.84	27.99	28.08	28.16	28.25	28.33	28.41	28.50	28.58	28.67	1.6
1.7	28.75	0.82	28.83	28.91	29.00	29.08	29.16	29.24	29.32	29.41	29.49	1.7
1.8	29.57	0.80	29.65	29.73	29.81	29.89	29.97	30.05	30.13	30.21	30.29	1.8
1.9	30.37	0.78	30.45	30.53	30.60	30.68	30.76	30.84	30.92	30.99	31.07	1.9
2.0	31.15	0.76	31.23	31.30	31.38	31.45	31.53	31.61	31.68	31.76	31.83	2.0
2.1	31.91	0.74	31.98	32.06	32.13	32.21	32.28	32.35	32.43	32.50	32.58	2.1
2.2	32.65	0.73	32.72	32.80	32.87	32.94	33.02	33.09	33.16	33.23	33.31	2.2
2.3	33.38	0.71	33.45	33.52	33.59	33.66	33.74	33.81	33.88	33.95	34.02	2.3
2.4	34.09	0.69	34.16	34.23	34.30	34.37	34.44	34.50	34.57	34.64	34.71	2.4
2.5	34.78	0.68	34.85	34.92	34.98	35.05	35.12	35.19	35.26	35.32	35.39	2.5
2.6	35.46	0.67	35.53	35.59	35.66	35.73	35.80	35.86	35.93	36.00	36.06	2.6
2.7	36.13	0.65	36.20	36.26	36.32	36.39	36.46	36.52	36.58	36.65	36.72	2.7
2.8	36.78	0.64	36.84	36.91	36.97	37.04	37.10	37.16	37.23	37.29	37.36	2.8
2.9	37.42	0.63	37.48	37.55	37.61	37.67	37.74	37.80	37.86	37.92	37.99	2.9
3.0	38.05	0.62	38.11	38.17	38.24	38.30	38.36	38.42	38.48	38.55	38.61	3.0
3.1	38.67	0.61	38.73	38.79	38.85	38.91	38.98	39.04	39.10	39.16	39.22	3.1
3.2	39.28	0.60	39.34	39.40	39.46	39.52	39.58	39.64	39.70	39.76	39.82	3.2
3.3	39.88	0.59	39.94	40.00	40.06	40.12	40.18	40.23	40.29	40.35	40.41	3.3
3.4	40.47	0.58	40.53	40.59	40.64	40.70	40.76	40.82	40.88	40.93	40.99	3.4

Notes: Hundredths values computed by straight-line interpolation except within the range marked "Curvilinear." The rating is based on 8 volumetric discharge measurements (Nos. VIII-IVI) made Jan. 15, 1948.

TABLE 49

SUMMARY OF PITOMETER AND VOLUMETRIC DISCHARGE MEASUREMENTS

(Lettered series are pitometer measurements; numbered series are volumetric measurements.)

SERIES	DATE	SEC-TION	CROSS SECTION	DEPTH	AREA	VELOCITY	METHOD	DISCHARGE	NORMAL DEPTH	DIFFERENTIAL GAGE READINGS 12-INCH CCl_4 & Gas.	12-INCH CCl_4	12-INCH $2CHBr_2$	24-INCH $2CHBr_2$	VARIATION FROM RATING FOR NORMAL DEPTH	12-INCH CCl_4 & Gas.	12-INCH CCl_4	12-INCH $2CHBr_2$	24-INCH $2CHBr_2$
				ft.	sq.ft.	ft./sec.		c.f.s.	ft.	ft.	ft.	ft.	ft.	%	%	%	%	%
	1947																	
A	July 22	78	5,6 & 7	0.613	0.613	1.27	∫	0.778	0.449		0.075			-0.3		-5.1		
B	July 29	78	5	1.798	4.55	1.65	∫	7.49				1.80					-2.6	
C	Aug. 4	78	5,6 & 7	0.976	0.976	1.80	∫	1.76	0.878		0.37	0.11		-1.1		-4.9	-4.9	
D	Aug. 9	78	5,6 & 7	0.978	0.978	1.41	∫	1.38	0.679		0.165	0.065		+6.2		+12.2	-2.8	
E	Aug. 9	123	5,6 & 7	0.915	0.915	1.41	∫	1.29	0.679		0.165	0.065		-0.8		+4.9	-9.2	
F	Aug. 11	123	5,6 & 7	0.937	0.937	1.37	.2-.8	[a]1.28	0.668		0.195	0.058		0		-4.5	-4.5	
G	[b]Sept. 3	01	5,6 & 7	0.599	0.599	1.27	∫	0.759	0.467	0.160	0.06			-7.4	+1.2	+4.0		
H	Sept. 3	01	5,6 & 7	0.874	0.874	1.45	.2-.8	[a]1.27	0.692	0.490	0.185			-4.5	-3.8	-2.3		
J	Sept. 6	01	5,6 & 7	0.998	0.998	1.77	∫	1.77	0.908	0.93	0.38			-4.3	-3.8	-5.9		
	1944																	
I	July 5							15.1					0.436					+2.7
II	July 5							11.8					0.263					+3.0
III	July 5							8.61					0.141					+2.3
IV	July 7							13.1					0.357					-1.7
V	July 7							21.4					0.938					-0.2
VI	July 7							34.1					2.323					+1.7
	1948																	
VII	Jan. 15							4.30					0.03					+9.1
VIII	Jan. 15							7.84					0.12					+0.8
IX	Jan. 15							11.0					0.24					+0.4
X	Jan. 15							14.8					0.445					-0.3
XI	Jan. 15							17.9					0.665					-1.1
XII	Jan. 15							20.7					0.87					+0.2
XIII	Jan. 15							23.6					1.19					-2.2
XIV	Jan. 15							26.5					1.46					-0.7
XV	Jan. 15							29.3					1.70					+1.9
XVI	Jan. 15							30.9					1.91					+1.5

[a] Method coefficient of 0.980 has been applied to measured discharge. [b] Baffles installed at sections 0, 40 and 60 Aug. 13-22, 1947.

TABLE 50

SUMMARY OF CURRENT-METER DISCHARGE MEASUREMENTS

SERIES	DATE	CROSS SECTION	DISCHARGE	NORMAL DEPTH	DIFFERENTIAL GAGE 12-INCH CCl_4	12-INCH $2CHBr_2$	24-INCH $2CHBr_2$	VARIATION FROM RATING FOR NORMAL DEPTH	12-INCH CCl_4	12-INCH $2CHBr_2$	24-INCH $2CHBr_2$
			c.f.s.	ft.	ft.	ft.	ft.	%	%	%	%
	1944										
1	May 15	1,2	2.66	0.316	0.74	0.23		-2.6	+1.1	-1.1	
2	May 16	1,2	6.80	0.536	4.18	1.26		+4.9	+6.8	+5.9	
3	May 16	1,2	15.2	0.942			0.48	-2.1			-1.4
4	May 18	1,2	22.3	1.203			1.02	0			-0.2
5	May 18	1	39.6	1.833			3.23	-1.4			+0.4
6	May 20	1,2	7.84	0.611		1.88		-1.6		-0.4	
7	May 23	1,2	12.4	0.810		4.45		+0.6		+1.6	
8	June 22	1,2	3.82	0.386	1.48	0.44		0	+1.9	+1.9	
9	July 7	1,2	14.8	0.907			0.45	+1.0			-0.9
10	July 24	1	34.7	1.648			2.57	-0.2			-1.6
11	Aug. 28	1,2	1.17	0.192	0.14			+3.5	+3.5		
12	Aug. 28	1,2	9.98	0.703				+0.7			
13	Aug. 29	1,2	5.84	0.504	3.37			-0.8	+2.3		
	1945										
14	Apr. 9	2	40.7	1.840			3.33	+0.8			+1.6
	1947										
15	Jan. 29	2;3	7.74	0.613		1.76		+3.1		+1.8	
16	Feb. 7	2;3	3.75	0.400	1.24	0.44		+1.1	+9.3	0	
17	Feb. 11	2;3	5.65	0.517	3.12	1.02		-0.7	+2.7	-1.9	
18	Feb. 13	2;3	5.83	0.513	3.32	1.01		+3.9	+2.8	+1.7	
19	Feb. 13	2;3	3.78	0.403	1.51	0.46		+0.5	-0.3	-1.6	
20	Feb. 20	2;3	11.3	0.791		3.96		0		-1.7	
21	Feb. 25	2;3	24.0	1.278			1.13	+2.0			+2.1
22	Feb. 25	2'	39.9	1.874			3.32	-0.5			-0.2
23	Apr. 1	4	20.4	1.419			0.82	+1.2			+1.6

TABLE 51 -- PART I

SIMULTANEOUS OBSERVATIONS OF NORMAL DEPTH AND/OR DIFFERENTIAL GAGES

SYMBOL	DATE	CROSS SECTION	NORMAL DEPTH	DIFFERENTIAL GAGE READING ------12-INCH------			24-INCH	VALVE 12-INCH	TURNS 24-INCH	DISCHARGE FROM DIFF. GAGE RATING	VAR. FROM NORMAL DEPTH RATING
				CCl_4 and GAS.	CCl_4	$2CHBr_2$	$2CHBr_2$				
			ft.	ft.	ft.	ft.	ft.			c.f.s.	%
	1944										
a	May 29	1,2	0.703			3.01		7.2		10.00	+0.9
b	July 10	1,2	1.120				0.84		15.6	20.30	+1.0
c	July 12	1,2	1.460				1.80			29.57	+0.5
d	Aug. 3	1	1.839				3.46		76.2	40.82	+1.1
e	Aug. 15	1,2	1.260				1.23		18.0	24.51	+2.7
f	Aug. 24	1,2	0.958				0.53		13.3	16.17	+1.5
	1945										
g	Mar. 19	2	0.391		1.46	0.44		3.55		3.74	-4.1
h	Apr. 6	2	1.489				1.84		23.0	29.89	-1.1
j	Apr. 11	2	0.612			1.80		5.76		7.69	-3.8
k	Apr. 21	2	0.812			4.44		8.77		12.20	-1.5
m	May 25	2	1.121				0.83		15.8	20.18	+0.2
	1947										
n	Mar. 20	4	0.780			1.80		5.75		7.69	+0.9
o	Mar. 22	4	1.028			4.44		8.75		12.20	+0.1
p	Mar. 25	4	2.315				3.29		52.0	39.82	+0.7
q	Mar. 25	4	2.109				2.58		30.3	35.32	+1.0
r	Mar. 25	4	1.873				1.84		23.0	29.89	+0.2
s	Mar. 25	4	1.591				1.13		17.6	23.51	-1.1
t	Mar. 25	4	1.406				0.80		15.4	19.83	-0.3
u	Mar. 25	4	1.135				0.42		12.8	14.43	+0.9
v	Mar. 27	4	0.528		1.53	0.45		3.55		3.80	+0.3
w	Apr. 3	4	1.877				1.86		23.2	30.05	+0.5
x	Apr. 15	4	1.369				0.75		15.15	19.20	+0.5
y	Apr. 17	4	2.759			2.75	3.35	7.0	52.0	49.72	+0.3
z	Apr. 17	4	2.335				3.29		52.0	39.82	-0.4
aa	Apr. 29	3	1.078				0.72		15.0	18.82	+3.0
ab	Apr. 29	3	1.305				1.21		18.4	24.32	+0.3
ac	Apr. 29	3	1.503				1.78		22.6	29.41	-0.7
ad	Apr. 29	3	1.741				2.45		28.8	34.44	-0.7
ae	Apr. 29	3	1.975				3.30		50.0	39.88	+0.4
af	Apr. 29	3	2.198		1.71	0.49	3.26	3.7	50.0	43.64	-2.2
ag	Apr. 29	3	2.400			2.53	3.29	6.9	50.0	48.97	-0.3
ah	May 1	3	0.601			1.74		5.65		7.56	+4.0
aj	May 1	3	0.772			3.81		8.1		11.28	+3.8
ak	May 1	3	0.404		1.57	0.46		3.6		3.86	+2.4
am	May 3	3	0.606			1.73		5.70		7.54	+2.3
an	May 8	3	1.512				1.81		22.6	29.65	-0.5

TABLE 51 -- (CONCLUDED)

SIMULTANEOUS OBSERVATIONS OF NORMAL DEPTH AND/OR DIFFERENTIAL GAGES

SYMBOL	DATE	CROSS SECTION	NORMAL DEPTH	DIFFERENTIAL GAGE READING ------12-INCH------		24-INCH		VALVE 12-INCH	TURNS 24-INCH	DISCHARGE FROM DIFF. GAGE RATING	VAR. FROM NORMAL DEPTH RATING
				CCl_4 and GAS.	CCl_4	$2CHBr_2$	$2CHBr_2$				
	1947		ft.	ft.	ft.	ft.	ft.			c.f.s.	%
ao	May 15	3	0.773			3.82		8.1		11.29	+3.6
ap	May 16	3	1.071				0.71		15.0	18.70	+3.3
aq	July 10	5	1.702			3.81		8.1		11.28	+0.2
ar	July 10	5	1.525			1.78		5.70		7.65	-0.6
as	July 10	5,6	1.287		1.56	0.47		3.55		3.87	-0.5
at	July 24	5	2.024				0.73		15.2	18.95	+1.9
au	July 24	5	2.460				1.76		22.4	29.24	-1.0
av	July 24	5	2.836				3.36		52.0	40.23	+0.9
aw	July 24	5	3.171			2.57	3.39	6.75	52.0	49.64	-0.1
ax	July 25	5	2.525				2.01		24.4	31.23	-0.2
ay	July 25	5	2.525				2.01		24.4	31.23	-0.2
az	July 31	5	1.704			3.87		8.1		11.37	+0.6
ba	July 31	5	1.704			3.87		8.1		11.37	+0.6
bb	Aug. 1	5,6	1.285		1.57	0.46		3.55		3.86	-0.3
bc	Aug. 2	5,6 & 7	1.158		0.80	0.24		2.88		2.74	+1.1
bd	Aug. 25	5,6 & 7	0.687	0.55	0.22					1.41	+6.8
be	Aug. 27	5,6 & 7	0.456	0.19	0.076			1.80		0.82	+3.8
bf	Sept. 5			0.27	0.10			1.82		0.98	
bg	Sept. 5			0.85	0.34			2.3		1.76	
bh	Sept. 5			1.16	0.44			2.5		2.04	
bj	Sept. 5			1.70	0.66			2.75		2.49	
bk	Sept. 5			2.30	0.88			3.0		2.89	
bm	Sept. 5			3.02	1.18			3.25		3.35	
bn	Sept. 5			3.80	1.49			3.50		3.77	
bo	Sept. 5			0.54	0.22			2.1		1.41	
bp	Sept. 6	6	2.992			2.61	3.42	6.75	52.0	49.89	+0.6
bq	Sept. 6	6	2.768				3.44		52.0	40.70	-2.2
br	Sept. 6	6	2.013				0.73		15.2	18.95	+1.1
bs	Sept. 8	5,6 & 7	0.471	0.16	0.07			1.8		0.75	-9.6
bt	Sept.10	6	2.431				2.03		24.4	31.38	+2.4
bu	Sept.15	5,6 & 7	0.905		0.38			2.38		1.88	+2.2
bv	Sept.15	5,6 & 7	0.905		0.39			2.38		1.90	+3.3
bw	Sept.17	6	1.294		1.56	0.46		3.55		3.85	-3.3
bx	Sept.20	7	1.295		1.56	0.47		3.55		3.87	-3.2
by	Sept.20	5,6 & 7	1.171		0.83	0.24		2.90		2.77	-1.1
bz	Sept.20	7	1.529			1.80		5.7		7.69	-1.0

TABLE 52 -- PART I

DETAILS OF CURRENT-METER DISCHARGE MEASUREMENTS

SERIES	DATE	BY	METER NO.	SECTION	DEPTH	AREA	AVG. VEL.	METHOD	COEFFICIENT METHOD	COEFFICIENT METER	DISCHARGE MEASURED	DISCHARGE ADJUSTED METHOD	DISCHARGE ADJUSTED METER	AVERAGE
	1944				ft.	sq.ft.	ft./sec.				c.f.s.	c.f.s.	c.f.s.	c.f.s.
1	May 15	JM	2067	78	0.316	1.576	1.25	.5	0.904	1.026	2.131	1.926	1.976	
1	May 15	JM	A-65	78	0.316	1.576	1.72	.5	0.904	1.000	3.005	2.717	2.717	2.66
1	May 15	JM	A-65	78	0.316	1.576	1.65	.6	0.926	1.000	2.814	2.606	2.606	
2	May 16	JM	2067	78	0.537	2.681	2.28	.5	0.904	1.026	6.589	5.956	6.111	
2	May 16	JM	2067	78	0.537	2.681	2.23	.6	0.926	1.026	6.282	5.817	5.968	
2	May 16	JM	A-65	78	0.537	2.681	2.60	.5	0.904	1.000	7.713	6.973	6.973	6.80
2	May 16	JM	A-65	78	0.537	2.681	2.47	.6	0.926	1.000	7.149	6.620	6.620	
3	May 16	JM	2067	78	0.942	4.706	3.33	.5	0.904	1.026	16.88	15.26	15.66	
3	May 16	JM	2067	78	0.942	4.706	3.26	.6	0.926	1.026	16.16	14.96	15.35	15.2
3	May 16	JM	2067	78	0.942	4.706	3.08	.2-.8	0.976	1.026	14.48	14.13	14.50	
3	May 16	WDM	A-65	78	0.942	4.706	3.11	.5	0.904	1.000	16.19	14.64	14.64	
3	May 16	JM	A-65	78	0.942	4.706	3.67	.6	0.926	1.000	18.67	17.29	17.29	
4	May 18	JM	2067	78	1.203	6.011	3.74	.5	0.904	1.026	24.25	21.92	22.49	
4	May 18	JM	2067	78	1.203	6.011	3.73	.6	0.926	1.026	23.59	21.84	22.41	22.3
4	May 18	JM	2067	78	1.203	6.011	3.64	.2-.8	0.976	1.026	21.84	21.32	21.87	
5	May 18	JM	2067	78	1.833	9.161	4.38	.5	0.904	1.026	43.27	39.12	40.14	
5	May 18	JM	2067	78	1.833	9.161	4.28	.6	0.926	1.026	41.25	38.20	39.19	39.6
5	May 18	JM	2067	78	1.833	9.161	4.31	.2-.8	0.976	1.026	39.47	38.52	39.52	
6	May 20	JM	2067	78	0.611	3.051	2.51	.5	0.904	1.026	8.267	7.473	7.667	
6	May 20	JM	2067	78	0.611	3.051	2.46	.6	0.926	1.026	7.886	7.302	7.492	
6	May 20	JMB	A-65	78	0.611	3.051	2.55	.5	0.904	1.000	8.596	7.771	7.771	
6	May 20	JMB	A-65	78	0.611	3.051	2.45	.6	0.926	1.000	8.081	7.483	7.483	
6	May 20	JMB	A-65	78	0.611	3.051	2.58	.2-.8	0.976	1.000	8.059	7.866	7.866	
6	May 20	JM	2067	78	1.131	5.651	1.45	.5	0.904	1.026	8.838	7.990	8.198	
6	May 20	JM	2067	78	1.131	5.651	1.38	.6	0.926	1.026	8.237	7.627	7.825	
6	May 20	JM	2067	78	1.131	5.651	1.36	.2-.8	0.976	1.026	7.680	7.496	7.691	
6	May 20	JMB	A-65	78	1.131	5.651	1.40	.5	0.904	1.000	8.769	7.927	7.927	7.84
6	May 20	JMB	A-65	78	1.131	5.651	1.38	.6	0.926	1.000	8.415	7.792	7.792	
6	May 20	JMB	A-65	78	1.131	5.651	1.41	.2-.8	0.976	1.000	8.144	7.949	7.949	
6	May 21	JM	2067	78	1.642	8.206	0.982	.5	0.904	1.026	8.691	7.857	8.061	
6	May 21	JM	2067	78	1.642	8.206	0.961	.6	0.926	1.026	8.296	7.682	7.882	
6	May 21	JM	2067	78	1.642	8.206	0.970	.2-.8	0.976	1.026	7.947	7.756	7.958	
6	May 21	JMB	A-65	78	1.642	8.206	0.980	.5	0.904	1.000	8.896	8.042	8.042	
6	May 21	JMB	A-65	78	1.642	8.206	0.964	.6	0.926	1.000	8.539	7.907	7.907	
6	May 21	JMB	A-65	78	1.642	8.206	0.957	.2-.8	0.976	1.000	8.046	7.853	7.853	
7	May 23	JM	A-65	78	0.810	4.046	3.51	.5	0.904	1.000	15.70	14.19	14.19	
7	May 23	JM	A-65	78	0.810	4.046	3.17	.6	0.926	1.000	13.87	12.84	12.84	
7	May 23	JM	A-65	78	0.810	4.046	2.91	.2-.8	0.976	1.000	12.05	11.76	11.76	
7	May 23	JMB	2067	78	0.810	4.046	3.02	.5	0.904	1.026	13.16	11.90	12.21	
7	May 23	JMB	2067	78	0.810	4.046	2.95	.6	0.926	1.026	12.55	11.62	11.92	
7	May 23	JMB	2067	78	1.402	7.006	1.83	.5	0.904	1.026	13.85	12.52	12.85	
7	May 23	JMB	2067	78	1.402	7.006	1.77	.6	0.926	1.026	13.07	12.10	12.41	
7	May 23	JMB	2067	78	1.402	7.006	1.73	.2-.8	0.976	1.026	12.07	11.78	12.09	
7	May 23	JM	A-65	78	1.402	7.006	1.79	.5	0.904	1.000	13.91	12.57	12.57	
7	May 23	JM	A-65	78	1.402	7.006	1.75	.6	0.926	1.000	13.27	12.29	12.29	12.4
7	May 23	JM	A-65	78	1.402	7.006	1.75	.2-.8	0.976	1.000	12.54	12.24	12.24	
7	May 23	JMB	2067	78	1.902	9.506	1.35	.5	0.904	1.026	13.88	12.55	12.88	
7	May 23	JMB	2067	78	1.902	9.506	1.33	.6	0.926	1.026	13.28	12.30	12.62	
7	May 23	JMB	2067	78	1.902	9.506	1.28	.2-.8	0.976	1.026	12.14	11.85	12.16	
7	May 23	JM	A-65	78	1.902	9.506	1.31	.5	0.904	1.000	13.80	12.48	12.48	
7	May 23	JM	A-65	78	1.902	9.506	1.33	.6	0.926	1.000	13.68	12.67	12.67	
7	May 23	JM	A-65	78	1.902	9.506	1.26	.2-.8	0.976	1.000	12.26	11.97	11.97	

TABLE 52 -- (CONTINUED)

DETAILS OF CURRENT-METER DISCHARGE MEASUREMENTS

SERIES	DATE	BY	METER NO.	SEC-TION	DEPTH	AREA	AVG. VEL.	METHOD	COEFFICIENT METHOD	COEFFICIENT METER	DISCHARGE MEAS-URED	DISCHARGE ADJUSTED METHOD	DISCHARGE ADJUSTED METER	AVERAGE
	1944				ft.	sq.ft.	ft./sec.				c.f.s.	c.f.s.	c.f.s.	c.f.s.
8	June 22	JM	2067	78	0.393	1.961	1.65	.5	0.904	1.026	3.499	3.163	3.245	
8	June 22	JM	2067	78	0.393	1.961	1.65	.6	0.926	1.026	3.396	3.145	3.227	
8	June 22	JMB	A-65	78	0.393	1.961	1.92	.5	0.904	1.000	4.164	3.764	3.764	
8	June 22	JMB	A-65	78	0.393	1.961	1.84	.6	0.926	1.000	3.891	3.603	3.603	
8	June 22	LHH	2067	78	1.051	5.251	0.738	.5	0.904	1.026	4.178	3.777	3.875	
8	June 22	LHH	2067	78	1.051	5.251	0.719	.6	0.926	1.026	3.975	3.681	3.777	
8	June 22	LHH	2067	78	1.051	5.251	0.714	.2-.8	0.976	1.026	3.745	3.655	3.750	
8	June 22	JMB	A-65	78	1.051	5.251	0.751	.5	0.904	1.000	4.360	3.941	3.941	
8	June 22	JMB	A-65	78	1.051	5.251	0.742	.6	0.926	1.000	4.206	3.895	3.895	
8	June 22	JMB	A-65	78	1.051	5.251	0.730	.2-.8	0.976	1.000	3.929	3.835	3.835	
8	June 22	JM	2067	78	1.585	7.921	0.502	.5	0.904	1.026	4.288	3.876	3.977	
8	June 22	JM	2067	78	1.585	7.921	0.498	.6	0.926	1.026	4.150	3.843	3.943	3.82
8	June 22	JM	2067	78	1.585	7.921	0.477	.2-.8	0.976	1.026	3.771	3.680	3.776	
8	June 22	JMB	A-65	78	1.585	7.921	0.494	.5	0.904	1.000	4.328	3.913	3.913	
8	June 22	JMB	A-65	78	1.585	7.921	0.477	.6	0.926	1.000	4.081	3.779	3.779	
8	June 22	JMB	A-65	78	1.585	7.921	0.475	.2-.8	0.976	1.000	3.859	3.766	3.766	
8	June 22	JM	2067	78	2.123	10.61	0.366	.5	0.904	1.026	4.189	3.787	3.885	
8	June 22	JM	2067	78	2.123	10.61	0.361	.6	0.926	1.026	4.036	3.737	3.834	
8	June 22	JM	2067	78	2.123	10.61	0.355	.2-.8	0.976	1.026	3.764	3.674	3.770	
8	June 22	JMB	A-65	78	2.123	10.61	0.349	.5	0.904	1.000	4.093	3.700	3.700	
8	June 22	JMB	A-65	78	2.123	10.61	0.359	.6	0.926	1.000	4.115	3.810	3.810	
8	June 22	JMB	A-65	78	2.123	10.61	0.359	.2-.8	0.976	1.000	3.907	3.813	3.813	
9	July 7	JMB	2067	78	1.429	7.141	2.10	.5	0.904	1.026	16.17	14.62	15.00	
9	July 7	JMB	2067	78	1.429	7.141	2.08	.6	0.926	1.026	15.61	14.45	14.83	
9	July 7	JMB	2067	78	1.429	7.141	2.05	.2-.8	0.976	1.026	14.59	14.24	14.61	14.8
9	July 7	JM	A-65	78	1.429	7.141	2.05	.5	0.904	1.000	16.20	14.64	14.64	
9	July 7	JM	A-65	78	1.429	7.141	2.05	.6	0.926	1.000	15.83	14.66	14.66	
9	July 7	JM	A-65	78	1.429	7.141	2.11	.2-.8	0.976	1.000	15.43	15.06	15.06	
10	July 24	JM	2067	78	2.352	11.76	2.90	.5	0.904	1.026	36.73	33.20	34.06	
10	July 24	JM	2067	78	2.352	11.76	2.87	.6	0.926	1.026	35.47	32.85	33.70	
10	July 24	JM	2067	78	2.352	11.76	3.03	.2-.8	0.976	1.026	35.57	34.72	35.62	34.7
10	July 24	JM	3866	78	2.352	11.76	2.89	.5	0.904	1.026	36.65	33.13	33.99	
10	July 24	JM	3866	78	2.352	11.76	2.91	.6	0.926	1.026	35.96	33.30	34.17	
10	July 24	JM	3866	78	2.352	11.76	3.13	.2-.8	0.976	1.026	36.72	35.84	36.77	
11	Aug. 28	WDM	2067	78	0.541	2.701	0.427	.5	0.904	1.026	1.244	1.125	1.154	
11	Aug. 28	EGB	A-65	78	0.541	2.701	0.434	.5	0.904	1.000	1.295	1.171	1.171	1.17
12	Aug. 28	WDM	2067	78	1.332	6.656	1.48	.6	0.926	1.026	10.40	9.630	9.880	
12	Aug. 28	EGB	A-65	78	1.332	6.656	1.51	.6	0.926	1.000	10.88	10.07	10.07	9.98
13	Aug. 29	WDM	2067	78	1.362	6.806	0.857	.6	0.926	1.026	6.139	5.685	5.833	
13	Aug. 29	EGB	A-65	78	1.362	6.806	0.859	.6	0.926	1.000	6.315	5.848	5.848	5.84
	1945													
14	Apr. 9	EGB	2067	78	1.840	9.196	4.25	.6	0.926	1.026	41.14	38.10	39.09	
14	Apr. 9	WDM	2067	78	1.840	9.196	4.36	.2-.8	0.976	1.026	40.01	39.05	40.07	
14	Apr. 9	EGB	2067	78	3.066	15.33	2.70	.2-.8	0.976	1.026	41.37	40.38	41.43	40.7
	1947													
15	Jan. 29	JMB	2067	78	0.615	3.071	2.48	.6	0.926	1.026	8.024	7.430	7.623	
15	Jan. 29	JMB	2067	78	2.782	13.91	0.556	.2-.8	0.976	1.026	7.730	7.544	7.740	7.74
16	Feb. 7	JMB	282	78	0.403	2.011	1.86	.6	0.926	1.000	4.043	3.744	3.744	
16	Feb. 7	JMB	282	18	0.399	1.991	1.81	.6	0.926	1.000	3.896	3.608	3.608	
16	Feb. 7	JMB	282	78	1.126	5.626	0.676	.2-.8	0.976	1.000	3.897	3.803	3.803	3.75
16	Feb. 7	JMB	282	18	1.298	6.486	0.569	.2-.8	0.976	1.000	3.781	3.690	3.690	

TABLE 52 -- (CONCLUDED)

DETAILS OF CURRENT-METER DISCHARGE MEASUREMENTS

SERIES	DATE	BY	METER NO.	SECTION	DEPTH	AREA	AVG. VEL.	METHOD	COEFFICIENT METHOD	COEFFICIENT METER	DISCHARGE MEASURED	DISCHARGE ADJUSTED METHOD	DISCHARGE ADJUSTED METER	AVERAGE
	1947				ft.	sq.ft.	ft./sec.				c.f.s.	c.f.s.	c.f.s.	c.f.s.
17	Feb. 11	JMB	282	78	2.241	11.20	0.509	.2-.8	0.976	1.000	5.840	5.700	5.700	5.65
17	Feb. 11	JMB	282	18	2.408	12.04	0.466	.2-.8	0.976	1.000	5.746	5.608	5.608	
17	Feb. 11	JMB	282	18	0.507	2.531	2.08	.6	0.926	1.000	5.672	5.252	5.252	
17	Feb. 11	JMB	282	78	0.517	2.581	2.14	.6	0.926	1.000	5.969	5.527	5.527	
18	Feb. 13	JMB	2067	18	1.046	5.226	1.11	.6	0.926	1.026	6.098	5.647	5.794	5.83
18	Feb. 13	JMB	2067	36	0.996	4.976	1.19	.6	0.926	1.026	6.214	5.754	5.904	
18	Feb. 13	JMB	2067	58	0.940	4.696	1.25	.6	0.926	1.026	6.181	5.724	5.873	
18	Feb. 13	JMB	2067	78	0.886	4.426	1.33	.6	0.926	1.026	6.181	5.724	5.873	
18	Feb. 13	JMB	2067	98	0.834	4.166	1.37	.6	0.926	1.026	6.023	5.577	5.722	
18	Feb. 13	JMB	2067	118	0.784	3.916	1.49	.6	0.926	1.026	6.127	5.674	5.822	
19	Feb. 13	JMB	2067	18	0.902	4.506	0.863	.6	0.926	1.026	4.093	3.790	3.889	
19	Feb. 13	JMB	2067	78	0.739	3.691	1.06	.6	0.926	1.026	4.136	3.830	3.930	
19	Feb. 13	JMB	282	78	1.619	8.091	0.467	.2-.8	0.976	1.000	3.874	3.781	3.781	3.78
20	Feb. 20	IJ	282	18	1.691	8.451	1.34	∫	1.000	1.000	11.30	11.30	11.30	11.3
20	Feb. 20	IJ	282	78	1.531	7.651	1.47	∫	1.000	1.000	11.28	11.28	11.28	
20	Feb. 20	IJ	282	98	1.481	7.401	1.56	.6	0.926	1.000	12.45	11.53	11.53	
20	Feb. 20	IJ	282	98	1.481	7.401	1.55	.5	0.904	1.000	12.68	11.46	11.46	
21	Feb. 25	JMB	2067	78	1.276	6.376	3.67	.6	0.926	1.026	24.66	22.84	23.43	
21	Feb. 25	JMB	2067	18	1.280	6.396	3.61	.6	0.926	1.026	24.32	22.52	23.11	
21	Feb. 25	JMB	2067	78	2.972	14.86	1.61	.2-.8	0.976	1.026	23.92	23.35	23.96	24.0
22	Feb. 25	JMB	2067	78	1.879	9.391	4.32	.2-.8	0.976	1.026	40.54	39.57	40.60	39.9
22	Feb. 25	JMB	2067	78	3.133	15.66	2.57	.2-.8	0.976	1.026	40.18	39.22	40.24	
22	Feb. 25	JMB	2067	18	3.267	16.33	2.38	.2-.8	0.976	1.026	38.87	37.94	38.93	
22	Feb. 25	JMB	2067	78	3.133	15.66	2.49	.6	0.926	1.026	41.08	38.04	39.03	
23	Apr. 1	JMB	2067	78	2.811	14.05	1.46	∫	1.000	1.026	19.97	19.97	20.49	20.4
23	Apr. 1	JMB	2067	18	2.811	14.05	1.45	∫	1.000	1.026	19.88	19.88	20.40	

Recent Publications of
The Engineering Experiment Station

Bulletins

NO.

353. An Analysis of the Motion of a Rigid Body, by E. W. Suppiger. 1941. *Thirty cents.*
354. The Viscosity of Gases at High Pressures, by E. W. Comings, B. J. Mayland, and R. S. Egly. 1944. *Forty cents.*
355. Fuel Savings Resulting from Use of Insulation and Storm Windows, by A. P. Kratz and S. Konzo. 1944. *Twenty cents.*
356. Heat Emission and Friction Heads of Hot-Water Radiators and Convectors, by F. E. Giesecke and A. P. Kratz. 1945. *Twenty-five cents.*
357. The Bonding Action of Clays: Part I—Clays in Green Molding Sand, by R. E. Grim and F. L. Cuthbert. 1945. *Free upon request.*
358. A Study of Radiant Baseboard Heating in the I = B = R Research Home, by A. P. Kratz and W. S. Harris. 1945. *Twenty cents.*
359. Grain Sizes Produced by Recrystallization and Coalescence in Cold-Rolled Cartridge Brass, by H. L. Walker. 1945. *Free upon request.*
360. Investigation of the Strength of Riveted Joints in Copper Sheets, by W. M. Wilson and A. M. Ozelsel. 1945. *Free upon request.*
361. Residual Stresses in Welded Structures, by W. M. Wilson and Chao-Chien Hao. 1946. *Seventy cents.*
362. The Bonding Action of Clays: Part II—Clays in Dry Molding Sands, by R. E. Grim and F. L. Cuthbert. 1946. *Free upon request.*
363. Studies of Slab and Beam Highway Bridges: Part I—Tests of Simple-Span Right I-Beam Bridges, by N. M. Newmark, C. P. Siess, and R. R. Penman. 1946. *Free upon request.*
364. Steam Turbine Blade Deposits, by F. G. Straub. 1946. *Free upon request.*
365. Experience in Illinois with Joints in Concrete Pavements, by J. S. Crandell, V. L. Glover, W. C. Huntington, J. D. Lindsay, F. E. Richart, and C. C. Wiley. 1947. *Free upon request.*
366. Performance of an Indirect Storage Type of Hot-Water Heater, by A. P. Kratz and W. S. Harris. 1947. *Free upon request.*
367. Influence Charts for Computation of Vertical Displacements in Elastic Foundations, by N. M. Newmark. 1947. *Free upon request.*
368. The Effect of Eccentric Loading, Protective Shells, Slenderness Ratios, and Other Variables in Reinforced Concrete Columns, by F. E. Richart, J. O. Draffin, T. A. Olson, and R. H. Heitman. 1947. *Free upon request.*
369. Studies of Highway Skew Slab-Bridges with Curbs: Part I—Results of Analyses, by V. P. Jensen and J. W. Allen. 1947. *Free upon request.*
370. The Illinois Smokeless Furnace, by J. R. Fellows, A. P. Kratz, and S. Konzo. 1947. *Free upon request.*
371. Rate of Propagation of Fatigue Cracks in 12-inch by ¾-inch Steel Plates with Severe Geometrical Stress-Raisers, by W. M. Wilson and J. L. Burke. 1947. *Free upon request.*
372. The Effect of Non-Uniform Distribution of Stress on the Yield Strength of Steel, by D. Morkovin and O. Sidebottom. 1947. *Free upon request.*
373. History of Building Foundations in Chicago, by R. B. Peck. 1948. *Free upon request.*
374. The Free Surface Around, and Interference Between, Gravity Wells, by H. E. Babbitt and D. H. Caldwell. 1948. *Free upon request.*
375. Studies of Slab and Beam Highway Bridges: Part II—Tests of Simple-Span Skew I-Beam Bridges, by N. M. Newmark, C. P. Siess, and W. M. Peckham. 1948. *Free upon request.*
376. Highspeed Freight Train Resistance: Its Relation to Average Car Weight, by John K. Tuthill. 1948. *Free upon request.*
377. Flexural Fatigue Strength of Steel Beams, by W. M. Wilson. 1948. *Free upon request.*
378. An Investigation of Creep, Fracture, and Bending of Lead and Lead Alloys for Cable Sheathing—Series 1946, by C. W. Dollins. 1948. *Free upon request.*
379. Non-Pressure Treatments of Round Northern White Cedar Timbers with Creosote, by E. E. King. 1948. *Free upon request.*

Bulletins (Continued)

NO.

380. Fatigue Strength of Fillet-Weld, Plug-Weld, and Slot-Weld Joints Connecting Steel Structural Members, by W. M. Wilson, W. H. Munse, and W. H. Bruckner. *In press.*
381. An Investigation of the Backwater Profile for Steady Flow in Prismatic Channels, by W. M. Lansford and W. D. Mitchell. 1948. *Free upon request.*

Circulars

NO.

44. Combustion Efficiencies as Related to Performance of Domestic Heating Plants, by A. P. Kratz, S. Konzo, and D. W. Thomson. 1942. *Twenty cents.*
45. Simplified Procedure for Selecting Capacities of Duct Systems for Gravity Warm-Air Heating Plants, by A. P. Kratz and S. Konzo. 1942. *Twenty-five cents.*
46. Hand-Firing of Bituminous Coal in the Home, by A. P. Kratz, J. R. Fellows, and J. C. Miles. 1942. *Free upon request.*
47. Save Fuel for Victory. 1942. *Free upon request.*
48. Magnetron Oscillator for Instruction and Research in Microwave Techniques, by J. T. Tykociner and L. R. Bloom. 1944. *Twenty cents.*
49. The Drainage of Airports, by W. W. Horner. 1944. *Twenty-five cents.*
50. Bibliography of Electro-Organic Chemistry, by S. Swann, Jr. 1945. *Free upon request.*
51. Rating Equations for Hand-Fired Warm-Air Furnaces, by A. P. Kratz, S. Konzo, and J. A. Henry. 1945. *Thirty cents.*
52. The Railroad Dynamometer Car of the University of Illinois and the Illinois Central Railroad, by J. K. Tuthill. 1947. *Free upon request.*
53. Papers Presented at the Seventh Short Course in Coal Utilization. 1948. *Free upon request.*
54. Papers Presented at the First Short Course on Hot Water and Steam Heating Systems, held at the Undergraduate Division, University of Illinois, Navy Pier, September 9-11, 1947. 1948. *Free upon request.*

Reprints

NO.

26. First Progress Report of the Investigation of Fatigue Failures in Rail Joint Bars, by N. J. Alleman. 1943. *Free upon request.*
27. A Brief History of Lime, Cement, Concrete, and Reinforced Concrete, by J. O. Draffin. 1943. *Free upon request.*
28. Tenth Progress Report of the Joint Investigation of Fissures in Railroad Rails, by R. E. Cramer and R. S. Jensen. 1944. *Free upon request.*
29. Second Progress Report of the Investigation of Shelly Spots in Railroad Rails, by R. E. Cramer. 1944. *Free upon request.*
30. Second Progress Report of the Investigation of Fatigue Failures in Rail Joint Bars, by N. J. Alleman. 1944. *Free upon request.*
31. Principles of Heat Treating Steel, by H. L. Walker. 1944. *None available.*
32. Progress Reports of Investigation of Railroad Rails and Joint Bars, by H. F. Moore, R. E. Cramer, N. J. Alleman, and R. S. Jensen. 1945. *Free upon request.*
33. Progress Report on the Effect of the Ratio of Wheel Diameter to Wheel Load on Extent of Rail Damage, by N. J. Alleman. 1945. *Fifteen cents.*
34. Progress Report of the Joint Investigation of Methods of Roadbed Stabilization, by R. B. Peck. 1946. *Free upon request.*
35. Progress Reports of Investigation of Railroad Rails and Joint Bars, by R. E. Cramer, N. J. Alleman, and R. S. Jensen. 1946. *Free upon request.*
36. Electro-Organic Chemical Preparations: Part III, by S. Swann, Jr. 1947. *Fifteen cents.*
37. Progress Reports of Investigation of Railroad Rails and Joint Bars, by R. E. Cramer, N. J. Alleman, and R. S. Jensen. 1947. *Free upon request.*
38. Second Progress Report of the Investigation of Methods of Roadbed Stabilization, by R. Smith, R. B. Peck, and T. H. Thornburn. 1947. *None available.*
39. Progress Reports of Investigation of Railroad Rails and Joint Bars, by R. E. Cramer and R. S. Jensen. 1948. *Free upon request.*
40. Third Progress Report of the Investigation of Methods of Roadbed Stabilization, by Rockwell Smith. 1948. *Free upon request.*